THE AMERICAN GAS LIGHT JOURNAL

PUBLISHED WEEKLY, AT NO. 42 PINE STREET.

VOLUME XCVII., No. 9.
Whole No. 1,942.

NEW YORK, MONDAY, AUGUST 26, 1912.

Subscription, $3 Per Year.
$4 Canada, $5 Foreign.

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Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

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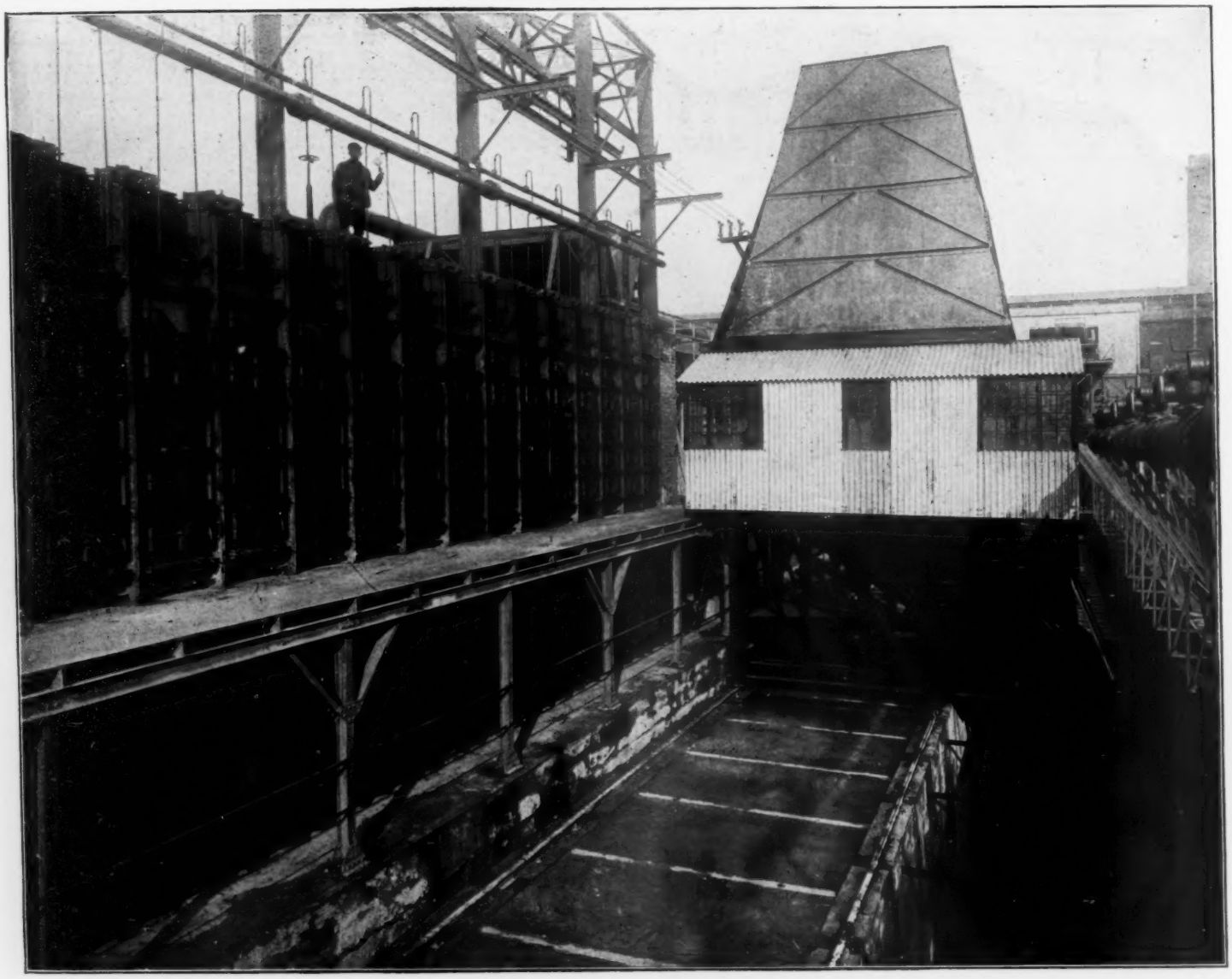
SMITHSONIAN DEPOSIT

GAS OVENS.

A COMPARISON OF ACTUAL OPERATING RESULTS.

In the Vienna Plant, they have also some 56 inclined retorts and from the same coal they obtain the following results:



BATTERY OF EIGHTEEN OVENS AT VIENNA.

	KOPPERS REGENERATIVE GAS OVENS.	INCLINED RETORTS.
Gas Yield per ton of coal,	12,000	9,890
NH_3 per ton of coal,	5.98	4.60
Carbon in Tar,	3 per cent.	12 per cent.

For further data see our Brochures Nos. 3 and 4.

H. KOPPERS COMPANY,

CONSTRUCTORS OF HORIZONTAL CROSS-REGENERATIVE COKE AND GAS OVENS,

5 S. Wabash Avenue, - - - CHICAGO, ILLINOIS.

THE AMERICAN
GAS LIGHT JOURNAL

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Electrolysis From Stray Electric Currents.

[A Lecture Delivered before the American Water Works Association at Louisville, Ky., June 6th, 1912, By ALBERT F. GANZ, M. E., Professor of Electrical Engineering, Stevens Institute Technology, Hoboken, N. J.]

Damage and Danger Produced by Stray Electric Currents on Underground Piping—It has already been pointed out that damage from electrolysis to underground piping usually results in the neighborhood of the power station, from current leaving the pipe to flow to the rails and to other return conductors, and that service pipes in the same locality are more frequently damaged where they cross under and are positive to trolley rails. The destruction of underground piping by electrolysis is, however, by no means confined to positive districts in the neighborhood of the railway power station, but will occur at any point in the pipe where current leaves the pipe to flow to the surrounding soil. In Fig. 9 is shown a water pipe and trolley line near a salt water bay, about 8 miles distant from the railway power station supplying this trolley road. The trolley rails at this point are about 25 volts positive to the water pipe; that is, the water piping is in a highly negative district. The railway power

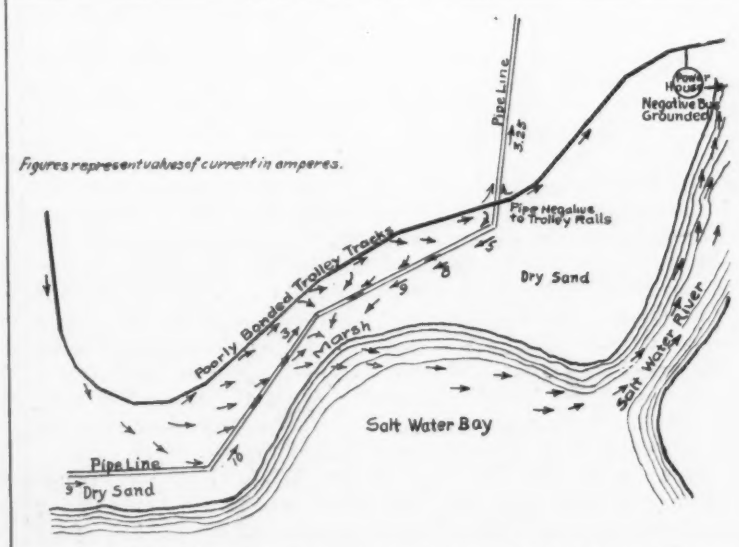

Fig. 9.—Diagram Showing Stray Current Leaving Water Main in Negative District.

station is located on the shore of a salt water bay, and its negative bus-bar is grounded through low resistance ground connections, so that large currents leak from the trolley rails at points shown in Fig. 9, then flow through the ground and the salt water of the bay to return to the negative bus bar at the railway power station. These stray currents in their path encounter the water main and flow part of the way on the water main. The values of current indicated on the main are average values obtained from 24-hour records. It is seen that in one section large currents leave this water main to flow to the surrounding soil and from there to the salt water. An examination of the main at this point also indicated that it had been badly corroded by electrolysis. This, therefore, affords an excellent example of destruction by electrolysis of a water main in a highly negative district.

In Fig. 10 is also shown a water main and service pipe crossing

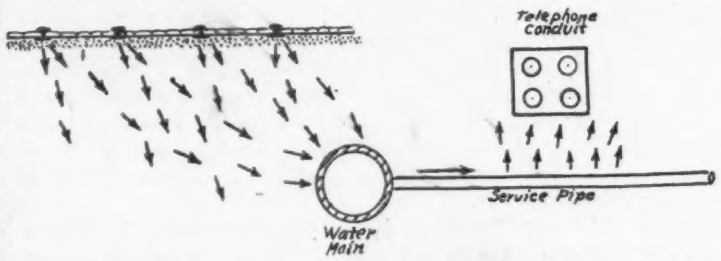

Fig. 10.—Example of Service Pipe Negative to Trolley Rails and Destroyed by Electrolysis due to Currents Flowing from Rails to Pipe and from Pipe to Telephone Cable Sheaths.

under trolley rails and under telephone ducts. At this point the pipe is also negative to the trolley rails, but positive to the lead sheaths of the telephone cables, the potential condition with reference to the cables being caused by the fact that the telephone cable sheaths are bonded to the railway return conductor at the power station. As shown in the diagram, current flows from the rails to the water pipe, and leaves the water service pipe where it crosses under the telephone ducts to flow to the cable sheaths, resulting in the destruction of the service pipe. An examination showed pits extending entirely through the service pipe directly under the telephone ducts and facing the

ducts. This, therefore, affords another illustration of destruction of a service pipe in a negative district.

Besides danger from electrolytic destruction of the pipes, stray currents, where they flow on underground piping systems, frequently enter buildings through service connections and produce a serious fire hazard. For example, current may flow into a building through a water service pipe, then flow from the house water piping to the house gas piping, and then out from the building through the gas service pipe. An example of this kind frequently met in practice is illustrated in Fig. 11. Such contacts between service pipes or between

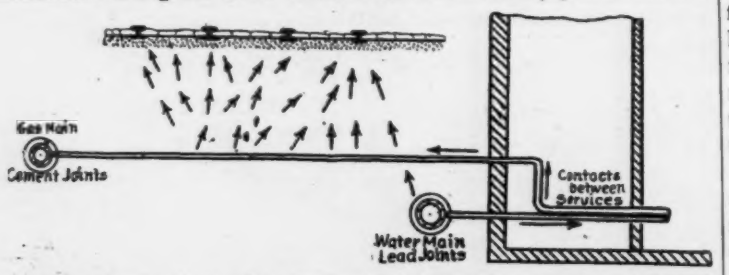

Fig. 11.—Diagram Showing Stray Currents Entering and Leaving Building Through Service Pipes and Causing Fire Hazard and also Destroying Gas Service Pipe by Electrolysis.

a service pipe and the lead sheathing of a telephone or a power cable frequently occur through metal ceilings, or where the pipes rest against each other. Since dangerous heating may be produced where the current flows through such contacts, or where vibration may momentarily separate the contacts and produce an arc, nearby inflammable material is in danger of being set on fire. The author has in fact found many cases where currents up to 30 amperes were flowing into and out of buildings through service pipes or lead cable sheaths. Evidences of arcing having occurred between such contacts in buildings have also been found. There is no doubt that many fires have started in this way, but it is always difficult to prove the cause of a fire because of the destruction resulting from the fire.

Corrosion not Caused by Electrolysis.—While electrolysis is undoubtedly responsible for much destruction of underground piping and other underground metallic structures, the author has frequently been asked to examine cases where the destruction had clearly not been produced by electrolysis from stray currents, but by altogether different causes. It must be remembered that corrosion of a metal from electrolysis can only occur where current leaves the metal to pass to an electrolyte, such as damp soil. Service pipes have sometimes been found destroyed inside of cellar walls where they were not in contact with an electrolyte; the corrosion here is purely of a chemical nature, and not in any way chargeable to stray current electrolysis. Brass copper pipes and fittings, and condenser tubes in contact with salt water, also corrode quite generally; but this is caused by electrochemical action of the salt or contaminated water upon the metal, not by electrolysis from stray currents. In some cases steel in reinforced concrete construction has also been found corroded, and the author has had occasion to investigate one important case where the steel reinforcement of a reinforced concrete building had been badly corroded, and where electrolysis from stray railway currents was claimed to be the cause of the corrosion. The construction, however, was such that there was no possibility of stray railway currents having passed from the steel to the surrounding concrete, which would be an absolutely essential requirement for the destruction by electrolysis, and the case was a clear one of corrosion from ordinary chemical causes. It is, therefore, wise where doubt exists to make a careful examination and determine positively whether or not a given case of corrosion was caused by stray current electrolysis.

Remedial Measure—There is only one complete remedy for electrolysis, and that is the use of a completely insulated return circuit. Such railways may be provided with double-overhead trolley wires, as used for example in Washington, D. C., Cincinnati and Havana; or with an insulated outgoing and return conductor in underground conduits, as used for example on the surface lines on Manhattan Island, or with separate insulated third and fourth rails for the outgoing and return current, as is used on the Metropolitan District Railway, in London. With these systems the running tracks are not used as a part of the electric circuit, and as both positive and negative sides of the circuit are insulated no stray currents are produced.

Where a road operates on a private right of-way, the rails can often be practically insulated from ground and the escape of current from the tracks prevented. For surface roads this can be practically accomplished by placing the rails on wooden ties above ground and using broken stone for ballast and keeping the rails out of contact with ground. In the case of railway lines operating on elevated structures the rails can be fastened to wooden ties and kept out of contact with the structure. These rails, supplemented where necessary with negative feeder cables, also insulated from the structure, can then be used for the return conductor. In this way the return circuit is quite thoroughly insulated from the elevated structure and from ground, and stray currents are entirely prevented.

A number of remedial measures, intended to reduce stray currents from electric railways using the grounded rails for a return conductor, have been tried. These methods may be divided into two classes, the first class aiming to remove the current harmlessly from pipes by metallic connections or bonds between the pipes and the railway return circuits; and the second aiming to minimize stray currents through ground.

Since stray currents cause damage only where they leave pipes to flow to the surrounding soil, attempts are frequently made to prevent destruction from electrolysis, by connecting or bonding the pipes or other structures by means of metallic conductors to the rails or to the negative return circuit, so as to remove the electric current by metallic conduction and thus prevent corrosion from electrolysis. This method can protect lead cable sheaths, because they form continuous electrical conductors; but it is not generally applicable to underground piping systems, because the latter do not form continuous electric conductors, being more or less discontinuous networks. While lead-calked joints usually have a relatively low resistance, it frequently happens that they develop such high resistance as to make them practically insulating joints, due undoubtedly to the formation of oxide coatings. Cement joints and cement pipes have such a high resistance, compared with iron pipes, that they are practically insulating. Bonding pipes to the rails or to the negative return circuit can only afford local protection, to the extent that the piping connected forms a continuous metallic conductor, and this latter is an unknown and indeterminate quantity in a piping network. In the practical working out of a bonding or drainage system two opposing tendencies develop: First, there is a reduction in the difference of potential between pipes and rails in the positive areas, and consequent reduction of damage to these areas; and, second, there is an increase of current flow on the pipes throughout the entire system, thus increasing the danger of trouble at high resistance joints, or other places where two piping systems or separate portions of the same system are electrically discontinuous. As a rule, in the early stages of this system, and especially in small networks, when there are comparatively few bond connections, and the resistances of the paths are, therefore, relatively high, the effect is apt to be beneficial, reducing the danger in positive areas more than it increases the danger elsewhere. As the system grows and the load increases, more and heavier bonds become necessary. The current on the pipes may finally become so great that the trouble, from current shunting around joints or between separate systems, will increase more rapidly than the danger in the positive areas is reduced, and any further increase in the bonding becomes an actual source of danger to the system. Since bonding transfers the trouble from the region where it was most evident to a new locality where it may require several years to manifest itself, the false impression is created that the trouble has been removed. It is due largely to this obscure manner in which trouble develops that has caused this method to become quite widely used. A number of cases have in fact been reported where a main, bonded to the negative return circuit at the power station, was completely destroyed by electrolysis a block or two away because of a high resistance joint in the main, forcing current to shunt around the joint and leave the main a short distance away from the power station. In one of these cases one entire block of main had to be replaced. This case is illustrated in Fig. 12. In another case the water main on one side

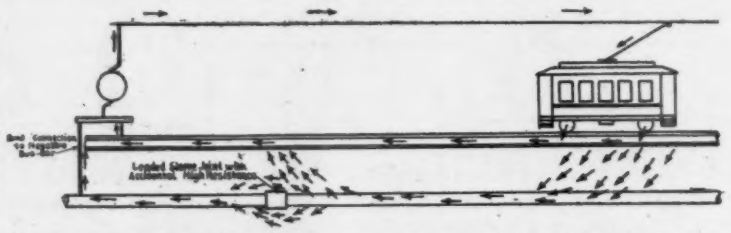

Fig. 12.—Diagram Showing Increased Danger from Electrolysis from Bonding Pipe to Rails Caused by Accidental High Resistance Joint in Pipe.

of the street was bonded to the negative return circuit at the power

station, and a main on the opposite side of the same street, although connected through cross-piping to the bonded main, was completely destroyed because high resistance joints had developed in the connecting pipes. In addition, bonding pipes as a means of protection always renders the bonded structures a part of the negative return circuit, and, therefore, a source of danger to other underground structures which are not bonded. It has, in fact, been frequently found that, where gas or water service pipes cross bonded cable sheaths, currents are induced to flow from the service pipes to the cable sheaths, and produce gradual destruction of the service pipes. A case of this kind was illustrated in Fig. 11. In the case of one city 19 service pipes were destroyed in the course of one year directly where these pipes cross telephone ducts containing cables whose sheaths were bonded to the railway return circuit. One engineer, who has studied this problem very carefully and entirely impartially, has very aptly likened bonding to the drug habit, producing temporary relief at the expense of permanent and perhaps irreparable injury to the victim, which injury is, however, too rarely attributed to the true cause.

Among the methods which have been used to minimize the escape of currents on systems using the grounded rails for the return conductors are increasing the resistance between rails and ground, increasing the resistance between pipes and ground, increasing the resistance along the line of the pipe by means of high resistance joints, and decreasing the drop in potential in the grounded rails.

The resistance between rails and ground can often be increased by using broken stone ballast, whereby the rails are kept out of contact with ground, and water is allowed to trickle away from the rails thereby maintaining high resistance between the rails and ground. Where an electric railway owns its own right-of-way, it is frequently feasible (as already stated) to practically insulate the rails from ground.

Attempts have been made to insulate pipes from ground by paints, dips, and insulating coverings. Experience as well as a large number of tests on such paints and dips have, however, shown that no dip or paint will protect a pipe against electrolysis in wet soil. The first difficulty is the mechanical one of applying the paint so as to form an absolutely perfect coating, and then to prevent mechanical damage to the coating. Where imperfections exist or develop aggravated trouble always ensues. Experience further shows that, even where paints or dips are apparently intact and perfect, electrolytic action is not prevented. and in fact very serious electrolytic pittings have been found under apparently good coatings. It has been found that in most cases the coatings applied have either been completely destroyed by the effects of the wet soil and the electric currents, or defects in the coating have developed causing concentrated corrosion at such defective spots. The destruction of paints in wet soil, where subjected to an electric current, is due to traces of moisture finding their way through the coating, giving rise to the flow of a feeble current and resulting in a very slight amount of electrolysis. The gases and other products of electrolysis then form blisters and finally rupture the coating. Pipes in positive districts, coated with imperfect insulating coatings, are in greater danger of electrolysis than bare pipes. Coating pipes in negative districts with insulating covering does some good in reducing the amount of stray current which reaches the pipes. Where it is attempted to apply a heated material, like pitch or asphaltum, to a cold pipe, it is impossible to completely cover the pipe. The only kind of insulating covering which appears to afford certain protection is a layer of at least 1 or 2 inches, of a material like coal tar pitch or asphaltum, of such a grade that it is not brittle and so will not crack, but yet is hard enough to remain in place. The best way to apply such a layer is to surround the pipe with a wooden box, support the pipe upon creosoted blocks of wood or upon blocks of glass, and then fill the space between the box and pipe with the molten material. As a further protection an insulated coupling should be introduced at each end of the section, covered so that, even if the covering should become defective at any point or points, no current can reach these points to corrode them by electrolysis. A pipe treated in this way, with the work done so as to be mechanically perfect, would undoubtedly be protected from electrolysis. However, the cost of carrying out such an installation is absolutely prohibitive, except in a few cases, such as in the case of service pipes in very bad localities or in the case of some very important individual pipe line of small size. It is not sufficient to apply the covering only in the positive district, nor, on the other hand, is it always necessary to cover the entire length of line. The portions which must be insulated can only be determined by properly conducted electrical tests. Experience has also shown that embedding a pipe in cement or concrete, even if this is several inches in thickness, does not protect the pipe from electrolysis, and in some cases it has been found that the pipe in concrete is destroyed at least as rapidly as when it is buried in ground.

Current flow on pipe lines can also be practically prevented by using insulating joints for every joint. Cement joints as ordinarily made do not generally produce metallic connection between the two pipes and may practically be classed with insulating joints. The cause of the high resistance of cement joints is probably due to the fact that, although every attempt is made to push the spigot end home into the bell when laying cast iron pipe, as a matter of fact in most cases the two pipes are not in metallic contact. Even where there is metallic contact this is probably over a comparatively small area, if not at a point. As the end of the spigot is always heavily coated with scale, such metallic contact generally forms a poor electrical connection of comparatively high resistance. It is a simple matter to positively prevent metallic contact, by inserting a ring of some cheap insulating material, such as fibre or cardboard, between the end of the spigot and the interior of the bell, and this has been done in some cases. The resistance of cement joints is then the electrical resistance of the cement intervening between the spigot and bell, and while cement is not an insulator, but on the contrary is probably as good a conductor as ordinary ground, yet, compared with iron, the resistance is so high that the cement joints practically interrupt the electrical continuity of the pipe line. A pipe line laid with all cement joints or with all insulating joints is, therefore, a discontinuous electrical conductor and is not capable of carrying stray electric currents. Such a pipe line cannot, therefore, pick up current in an extensive negative area to discharge it in a restricted positive area, which is generally the cause of the most serious electrolytic danger. For this reason a piping system with all cement or insulating joints is on the whole much less likely to be affected by electrolysis than a piping system with all lead or screw-coupling joints. Experience has shown, however, that a cement-jointed piping system is by no means immune from electrolysis, and there is abundant experience which shows that cement-jointed mains, and especially service pipes from such mains, can suffer severely from electrolysis. In these cases the stray currents reach the mains and service pipes from other pipes or by other paths. An example of a gas service pipe from a cement-jointed main destroyed by electrolysis from stray currents which reached the gas service pipe from the water piping is illustrated in Fig. 11.

A convenient form of insulating joint for small wrought iron or steel pipes is the Macallen joint, illustrated in Fig. 13. This is very

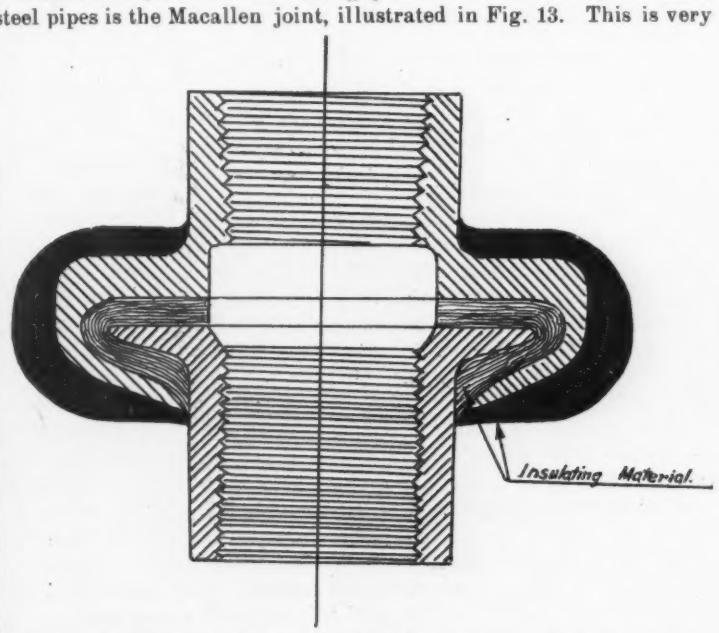

Fig. 13.—Section of Macallen Insulating Joint for Service Pipe.

largely used for insulating water and gas service pipes. A convenient form of insulating joint for large pipes is illustrated in Fig. 14, where a flanged joint is shown with a fiber disk between the surfaces of the flanges, and with the bolts insulated with fiber tubing and the bolt heads and nuts insulated with fiber washers. This form of flanged insulating joint has been very largely used for water and for gas mains. The Dresser insulating joints are also very satisfactory. Insulating joints can often be used to great advantage in special cases; as, for example, in the case illustrated in Fig. 11, where an insula-

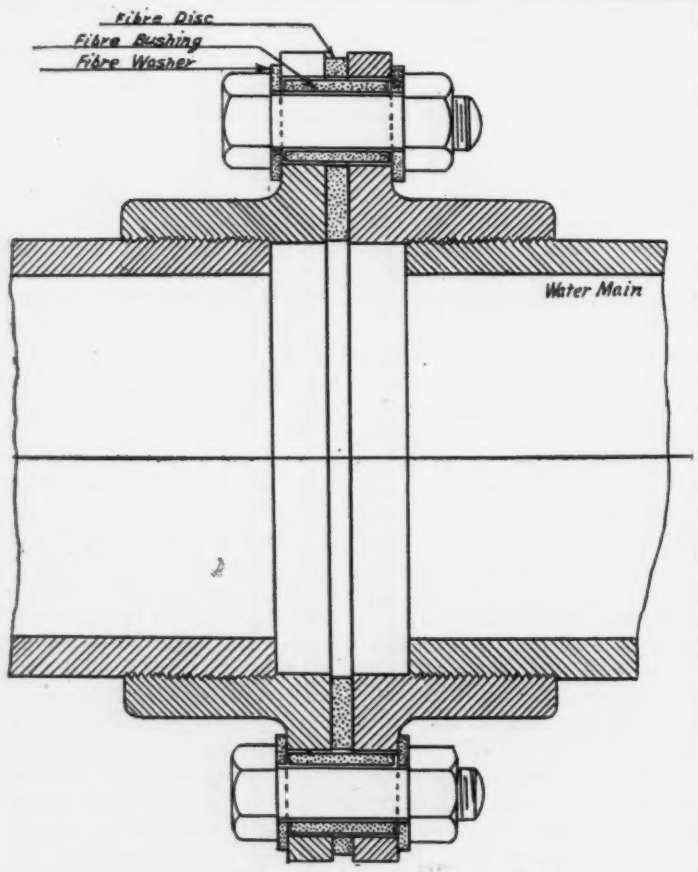

Fig. 14.—Section of Insulating Flanged Joint for Main.

ting joint in the gas service inside of the building would protect the gas service pipe, by preventing the current from flowing out of the building on this pipe. Insulating joints on mains must, however, be used with very great caution, as they can, under unfavorable conditions, do more harm than good. It is sometimes possible to use comparatively few insulating joints to break up the electrical continuity of a pipe line, and protect the pipe line from electrolysis, but such joints must be installed only after careful tests have shown that the current is not likely to shunt through ground around them. This depends largely upon the potential gradient through ground and upon the electrical resistance of the ground.

While relief from serious electrolysis can at times be obtained, by such special measures as insulating pipe coverings or insulating joints, it must be understood that all remedial measures should have for their first aim the reduction of the drop in potential in the rails to a minimum, because this removes the cause of the trouble. The first and most important step necessary to accomplish this is to maintain the rails perfectly bonded, so that the tracks themselves form continuous electrical conductors. The next important step is to limit the radius from the power station to which the station supplies electric power, so that current does not have to be returned from excessive lengths of rail lines to any one power station. This is usually accomplished in practice by supplying power to electric railways from distributed sub-stations. The next step is to remove the current from the rails wherever there is concentration of current, by means of insulated return feeders connecting from the rails at these points to the power station.

In order that such insulated return feeders should be most efficient in reducing drop in potential in grounded rails, these feeders should be proportioned for constant drop, so that the rails at all points where return feeders are connected are maintained at substantially the same potential under average load conditions. This also requires that the rails immediately in front of the power station must not be connected directly to the negative bus-bar, unless a resistance corresponding to the average resistance of the return feeders is connected in the circuit. Where it is necessary to bring current back from a distant point in the rails, it is sometimes more economical to employ a negative booster in series with this return feeder rather than make this feeder of such large cross-section as would be required to maintain the distant point in the rails at the same potential as the nearer connection points. With this system part of the voltage drop is actually removed from the rails and transferred to the insulated return feeders from which current cannot leak to ground.

An illustration of such an insulated return feeder system, proportioned for constant drop, is shown in Fig. 15. In this illustration it

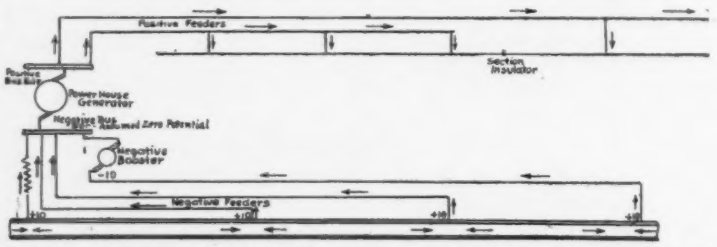

Fig. 15.—Diagram of Single Trolley Railway with Insulated Return Feeders and Negative Booster Showing Path of Currents and Assumed Rail Potentials.

is assumed that the negative bus-bar is at zero potential, and that the return feeder connection points on the rails are maintained at a potential of 10 volts with reference to the negative bus-bar. Under these circumstances, there is no tendency for current to flow from the rails between points where feeders are connected to the rails. The drop of 10 volts in the return feeders has also been removed from the rails.

The possibilities in the way of reducing stray currents, by means of properly proportioned insulated return feeders, was clearly shown by Mr. George I. Rhodes, in a paper entitled "Some Theoretical Notes on the Reduction of Earth Currents from Electric Railway Systems by Means of Negative Feeders," published in the "Transactions of the American Institute of Electrical Engineers," for 1907. A few of the figures from Mr. Rhodes' paper are reproduced in Fig. 16,

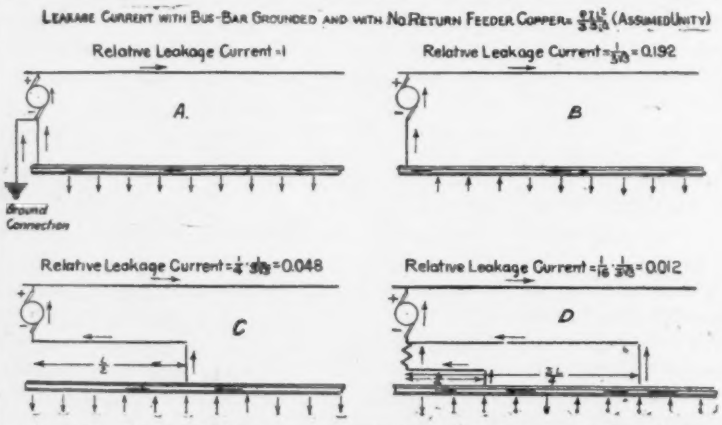
Leakage Current with Bus-Bar Grounded and with No Return Feeder Copper = $\frac{81i^2}{3\cdot3\Omega}$ (Assumed Unity)
Relative Leakage Current = 1
A.
Relative Leakage Current = $\frac{1}{5\cdot3}$ = 0.192
B
Ground Connection
Relative Leakage Current = $\frac{1}{4}\cdot\frac{1}{5\cdot3}$ = 0.048
C
Relative Leakage Current = $\frac{1}{16}\cdot\frac{1}{5\cdot3}$ = 0.012
D

Fig. 16.—Relative Leakage Currents with Various Return Circuit Conditions.

together with diagram illustrating the application of these figures. It will be seen that, with the negative bus-bar grounded through a ground connection of negligible resistance, in addition to being connected to the rails at the power station, the greatest amount of stray current is produced which is assumed unity for purpose of comparison. This is illustrated by Diagram *A*, Fig. 16. Disconnecting the negative bus-bar from ground connections, but not from rails, reduces stray currents to $\frac{1}{5}$ their former value, as illustrated by Diagram *B*, Fig. 16. Disconnecting the negative bus-bar from ground connections and from the rails at the power station, and returning the current by means of one insulated return feeder from the center of the line, reduces stray currents to 5 per cent. of their former value, as illustrated by Diagram *C*, of Fig. 16. By using two insulated return feeders with the negative bus-bar insulated, the stray currents are reduced to 1.2 per cent. of their former value, as illustrated by Diagram *D*, Fig. 16. It, therefore, can be seen that very great reduction of stray currents can be accomplished by insulating the negative bus-bar at the power station from ground connections and from rails, and returning the current by means of insulated return feeders.

Since power stations are usually located near the center of load of an electric railway system, it is usual in cities to find railway lines radiating out from the power station. Where the running tracks are connected to the negative bus-bar only in the immediate neighborhood of the power station, these running tracks are depended upon alone to return current to the power station, and there is consequently always very great concentration of stray current under these circumstances in the neighborhood of the power station. Such railway lines radiating out from the power station are illustrated diagrammatically in Fig. 17. In this figure, 8 railway lines are assumed radiating out from the power station. In the left hand diagram of Fig. 17 the rails of these lines are shown connected to the negative bus-bar at the power station only. It is seen that, as the result of

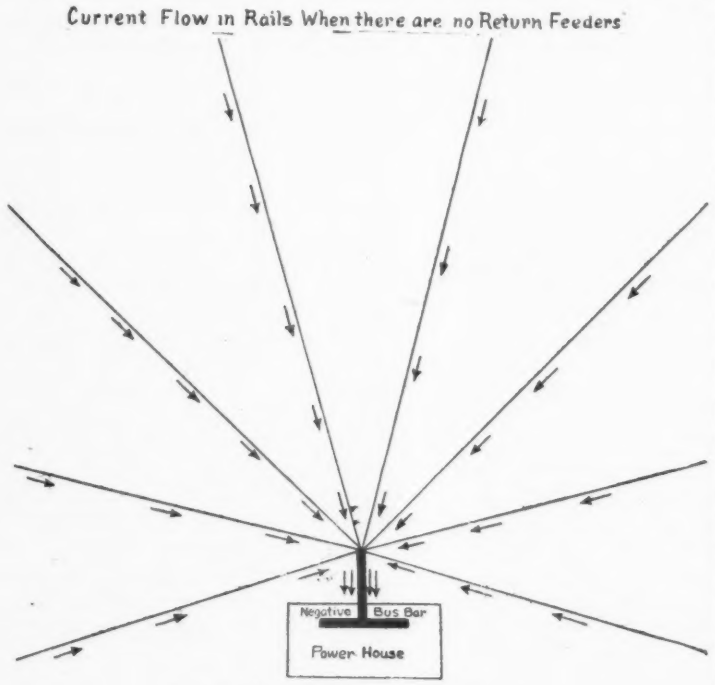
Current Flow in Rails When there are no Return Feeders
Negative
Bus Bar
Power House
Radial Insulated Return Feeder System
Current Flow in Rails and in Return Feeders
Negative Bus Bar
Power House

Fig. 17.—Diagram Showing Trolley Lines Radiating out from Power Station with and without Insulated Return Feeders and Showing Path of Return Currents.

this, all of the current used on the 8 railway lines flows in the rails towards the power station. The stray currents which leak from the rails to ground also concentrate in ground and on the underground piping in the neighborhood of the railway power station, where they must return to the rails to get back to the negative bus-bar.

If this connection between the negative busbar and the rails at the power station were removed, and the currents returned from the rails at points near the center of each railway line by means of insulated return feeders, as shown in the right hand diagram, Fig. 17, this concentration of current in the neighborhood of the power station will be entirely removed. With this arrangement, the current used by each individual line would tend to flow away from the rails at points away from the center of each line, and towards the rails near the center of each line. It is, therefore, seen that there is only $\frac{1}{8}$ of the current returning from the rails at any one point than there is when the rails are connected to the negative bus-bar only at the power station. Further, the total stray current through ground, with the conditions shown in the right hand diagram, will be only $\frac{1}{4}$ of the total stray current with the conditions of the left hand diagram, assuming similar soil conditions, so that at any one point the danger from electrolysis will be $\frac{1}{32}$ of what it is in the neighborhood of the power station with the first arrangement. As a matter of practice, however, the actual reduction is very much greater, because the return feeder connection points on the rails can be chosen so as to be located where the ground is high and dry, and consequently of high resistance, while the railway power station is generally located near water, where the ground is wet and of low resistance. Instead of connecting one insulated return feeder to the middle point of every line, as indicated in Fig. 17, a number of such feeders may be connected to a number of properly selected points in every line. In this way the drop in the rails, and consequently also the stray current produced, can be reduced to any desired value.

The reduction of drop in potential in rails, for the purpose of minimizing electrolysis, is the basis for various regulations and ordinances which have been enacted for the purpose of protecting underground metallic structures from electroylysis. For example, the well-known English Board of Trade Regulation limits the maximum allowable potential difference between any two points in the rails to 7 volts. In Germany, a joint committee representing the electric railway, gas and water interests, has adopted a regulation limiting the average allowable potential difference between any two points in the rails to 2.5 volts within a district encircling the urban district by a radial distance of 2 kilometers. Beyond this circle, the average potential drop in the rails must not exceed 1 volt per kilometer.

Where railway return circuit improvements have been made to such an extent that there are no longer any excessive drops in the grounded rails, it is generally found that stray currents on underground pipes are reduced to small and often negligible amounts. Where, however, stray currents, which are considered to be too large for safety are still found on such underground pipes after the railway return circuit has been thoroughly improved, then it is frequently possible and feasible to apply one or more of the other remedial measures, such as insulating joints in the pipes to take care of the small remaining stray current. Such other remedial measures, as bonding or insulating joints in pipes, must, however, never be applied unless the railway return circuit has been improved sufficiently to eliminate all excessive drops in the grounded rails.

(To be Continued.)

[CONTINUED FROM PAGE 124.]

PROCEEDINGS, EIGHTH ANNUAL MEETING, IOWA DISTRICT GAS ASSOCIATION.

HELD AT LINCOLN, NEB., MAY 22 TO 24, 1912.

SECOND DAY—MORNING SESSION.

Discussion on the Weisgerber Paper.

The President—For the first time in my experience I have heard a paper which takes the side taken by Mr. Weisgerber. I am glad to see it, for personally I am no lover of the prepayment meter. It means a great deal to the smaller gas works as to whether they shall pay 60 or 70 per cent. more for meters than they are now doing, because somebody has started this novelty. One time, in discussing this matter, I heard it said it was easier to get consumers with it because it was a new thing. I didn't call that salesmanship, and so stated at the time.

Mr. Warnick—I consider this a very valuable paper, for the writer has certainly gone into the subject exhaustively. No gas company can afford to take a chance on a prepayment meter where there is liable to be death. I would like to know if anyone has any statistics as to the number of fatalities traceable to its use.

Mr. Weisgerber—It has been stated that the deaths in a year averaged 8 to each 1,000 meters.

Mr. Gray—It seems the principal objections to the prepayment meter are the first cost and the high rate of expense on complaints. Those two points should be kept in mind at all times. I want to say, however, there is a field for prepayment meters, and that every company should own them. We have a very rigid rule for their use with people who have no established credit. We all no doubt find it necessary to shut off the gas for non-payment of bills from month to month. We do not exactly agree with Mr. Weisgerber when he says, if a man is not able to furnish a deposit, or a sufficient guarantee, he is unprofitable, because in a great many cases we find in such persons first-class consumers.

Mr. Zahm—This is a most debatable subject, and there are more discussions pro and con upon it than on possibly any other subject of equally vital interest to a gas company. I take just the opposite position from the author of the paper. Fully two-thirds, and I daresay nearly three-fourths, of our meters are prepayment. Conditions alter cases. In the smaller town it is considered an insult to ask a man for a deposit, regardless of whom he may be. When we started there we absolutely refused to set prepayment meters. At Mason City we have a very large foreign population, because of the number of brick and tile and cement plants. The foreign element is getting educated to the use of the gas range, and there are often as many as 15 or 20 people living in a house intended for 2 or 3, most of whom can't speak a word of English. We have on several occasions lifted $10 to $15 from a prepayment meter used by foreigners that couldn't "talk United States." They use 2 and 3-burner hot plates—sometimes only one burner—on which to prepare their meals, and they would be very suspicious if you collected a deposit from them, the reason for which it would be hard for an interpreter to explain. If you tell them to put their money in as they would buy kerosene or any other commodity, they think nothing of it, and I think very few of them realize the amount of money they put in. Our money loss from prepayment meters is less than ¼ of 1 per cent., and I think the number of meters per capita in Mason City may be laid very largely to the use of the prepayment meter.

Mr. Davis—I believe companies would be better off if they waived deposits and educated their patrons to the use of the regular meter. Educate them how to operate their appliances to get the best possible results. Have a good and efficient collecting department, being very careful in following up accounts, and I believe, as a rule, we would be better off financially in the use of the ordinary meter.

Mr. Fair—I subscribe to Mr. Zahm's statement in regard to conditions in the smaller town. That has been my expericnce in the smaller towns with which I have had to do. I would like to hear the views of Messrs. Lockwood and Smith on this subject. They have had considerable experience with plants in which the majority of the meters are of the prepayment type.

Mr. Lockwood—Mr. Weisgerber in discussing yesterday the report on manufactures made a very apt statement. He said most of the papers that are read at these associations comprise one man's ideas, and it would be a good plan if we could get together and have papers read from both viewpoints. If Mr. Crawford had been here with a paper on this subject the two papers together would give you pretty nearly the whole detail. As to the office expense in connection with quarter meters, we find that there is a good deal less expense with it than with the ordinary meter. In Clinton, when our collector reads a prepayment meter, he has a card with the consumer's name and address and the sheet number in the ledger. Under that is a place for the reading and the amount collected. When he comes in with his collections in the evening he brings in his satchel and turns it over to the cashier. There is no accounting then. The money from each meter is put in a separate envelope. The following morning the cashier opens the envelopes and counts the money, checking up the envelopes and entering the amounts on the ledger. With the ordinary meter you have the reading, amount of consumption, greatest amount of discount, and then at some future time in the month every day it is necessary to go over all the accounts and enter whether they are paid on that special day, thus requiring considerably more help in the office. In Clinton we have about 2,700 prepayment and about 1,800 ordinary meters. If we had 4,500 ordinary meters in use we would need considerable more help in the office, and one more collector. As to the matter of meters being broken open, we had 10 last year. Of those 10 we lost only 2. The people moved out and the meters were robbed. The amount taken out of the two meters together was only $1. When we receive notification that a meter has been broken open, we go to see the parties and find out what they know about it. If they know nothing, we tell them they signed an agreement to be responsible for that meter, and that until they make arrangements to replace the coin taken from the meter, and pay for the damages done, we cannot furnish them gas. Usually we have very little trouble in collecting. There is no need to go to law about it, because generally you will find they know more about it than anybody else. There are very few cases where a quarter meter is broken open by someone outside of the people in the building. We make it a special point with all consumers when their application is given to bring to their attention the fact that it is not necessary to put in only one quarter at a time; they can put in 2, or 3, or 4, and it won't interfere with the amount of gas they get for their money. As to complaints in the use of prepayment meters, I took occasion to look through our complaints for the last two months. We had two on 2,700 meters. They are generally from people who forgot to put in the quarter; occasionally it is a slug. In cases of slugs, the collectors are ordered to tell the people in a corteous manner they are requested not to use slugs in prepayment meters; that their applications specify U. S. quarters, and that if they persist in using slugs, we will be obliged to put in the ordinary meter, and shall expect a deposit—not a guarantee. Another point Mr. Weisgerber brought up was, the prepayment meter would pass 4 feet of gas after it was supposed to shut off. We inspect our meters at all times to see whether people are getting the right amount of gas for their money; but the point struck me that if a prepayment meter passed 4 feet of gas more than it should, it could be made so that it will pass exactly the right amount. It can be just as readily made to give 250 feet as 251 feet for a quarter, in the case of dollar gas. I scarcely think that point amounts to anything. With regard to the prepayment meter passing enough gas for a Junior light without a coin being inserted. While I never have had occasion to look that up, I never found any meters that did so through the prepayment attachment. We have a lot of old 3 and 5-light meters, that will pass that amount of gas, regardless of whether they have the prepayment attachment or not. The valves are worn considerably, and in many cases the diaphragms are beginning to leak; but I never found any of them that we could trace to the prepayment attachment.

The President—We all regret that Mr. Crawford could not be with us, but we certainly admit that he has a good representation.

Mr. Smith—It doesn't seem possible to pass judgment on the meter question as between small and large plants, whether the former or the latter should use the prepayment meter, or the plant that controls the electric light and the gas or the plant that simply controls the gas. In the plant I formerly managed we had over 400 prepayment meters, and we never lost a cent through having a meter broken open. It is very poor policy to have prepayment meters in hotels. We never ask a deposit on any meter. The plant that I have taken over now is all prepay, except in the commercial district. The prepays in the plant which I just left never gave any trouble to speak of; probably 20 times while I was there I was called to a qu arter meter. The prepays that I am using now for some reason or other were set in bad places and we had to change them. Of course, that is a matter of method more than anything else. It costs a good deal to put them in places where they are available to the customers. I don't know what make of meter Mr. Weisgerber refers to on which there are so many complaints, but it seems there should be a meter made by this time that would not necessitate so many trouble calls. I don't believe I would be able to pass judgment from my experience on the meter proposition in small towns; but if I were putting up a plant myself, I would have all ordinary meters and require a deposit as is done in large cities. Still, you will have electricity to compete with on lighting. The possibilities are, if they have a big minimum charge on their meter, as the electric light company has in the town where I am now, you wouldn't sell very many feet of gas for lighting during the winter months.

Mr. Hoskins—It is my firm belief that the prepayment meter is all right in its proper place. In Sioux City we have about ½ prepayment. A feature Mr. Weisgerber didn't bring out, disadvantageous to the prepayment meter, is from the new business man's standpoint. That department is one of the important departments. In all the larger cities they have elegant display rooms at their offices. The prepayment customer has no occasion to call at the office and doesn't come in contact with the display room. We sell a good many gas appliances through people coming to the office to pay their bills, thus seeing the goods we have in stock.

Mr. Lucena—One point, from the purely distribution standpoint, that did not come up on this proposition, I would like to talk about. I don't know how many gas companies believe in running what we call branch services to buildings, but my experience with prepayment meters in houses occupied by more than one consumer has been more or less a cause for demand to set the meter in some other part of the house. From the standpoint of safety to the meter it is desirable to put the meter where the consumer using it can watch it. As a general proposition I think it is undesirable to extend branch services to buildings, which I think is one more point against the prepayment meter.

Mr. Potter—I am not an advocate of setting prepayment meters, yet I don't agree with Mr. Weisgerber. The consumer who may have been delinquent will not be taken in if we set a prepay-

ment for a larger amount. Mr. Weisgerber's point is the consumer may get an idea that the meter can be set for a larger amount than a quarter, and becomes suspicious when his bill seems high. With the counter attachment for registering the quarters there is an absolute check on the money that the consumer put into the meter. All companies using prepayment meters have heard of the complaint of the customer who "put in so much money." Without the counter attachment it is all in doubt; with it there is an absolute proof whether the collector has turned in the money that was in the meter or whether the customer failed to put in the quarters that he claimed. I have in mind a case where a collector opened a prepayment meter, and finding 25 cents worth of gas there, turned the meter back so as to shut off the gas valve, put the 25 cents in his pocket, and then came the complaint of discrepancies. With this counter attachment on the meter the collector would not be able to do those things. In the first case he may continue this for years and there would be no way of discovering the discrepancy. The delinquent consumer, if obliged to put up a deposit or get a guarantor, will probably not be able to use gas; but he can put 25 cents in a prepayment meter, and I think from the new business standpoint we should get that business and not let it go because we will not put in the prepayment meter.

Mr. Borden—Our policy is to place as few prepayment meters as possible. About 8 per cent. of our total meters are of the prepayment type, and we try to hold them about at that point. We don't want it to grow any larger if we can avoid it; nevertheless there is a legitimate field for them, as we look at it. The restaurant keeper desires to hold his operating expenses to as low a point as possible. He turns the use of his gas appliances over to his chef, and the chef, of course, has *carte blanche* to go ahead and use them to the best of his knowledge and ability. But with the prepayment meter he is undoubtedly going to be a little more careful in the use of his gas, when he has to go to the meter and account for all the quarters he puts into it. I would like to ask someone present how he would set the prepayment meters in case the rates were based upon a sliding scale?

Mr. Walker—We have a sliding scale running from $1.25 down to $1. All of our prepayment meters are set at $1.25, and every 3 months we send a debit memorandum to the customer which is a cash voucher that he can present at the office and get his money. I am a great believer in the prepayment meter, and believe by their use we get a great deal of business that we would otherwise lose. I am certain that the collection and registration can be done more cheaply under the prepayment system than under the regular system. Looking over the statistics from the only authority I could command, I find there are very close to ¾ million prepayment meters in use in the United States to-day. I also know that there are almost ½ million in the city of London. I guess the prepayment meter has come to stay.

Mr. Smith—Speaking about the danger from the use of prepayment meters (I think 8 deaths to the 1,000 meters was the figure mentioned), the undertaker probably did a good business in that town; at the same time we don't want to have that all charged up to the gas company. No prepayment meter should be of the shut-off type. I would rather have the gas not check up right than to have somebody laid out with it. In looking over what few prepayment meters I have, if they don't shut off tight I don't consider it any detriment to the meter. As soon as the light commences to go down they run for the meter.

Mr. Vincent—Regarding accidents you can get statistics to prove anything. I would hate to accept these figures without further investigation. One real source of possible accident from the prepayment meter, aside from the insertion of a quarter after the gas has gone out, is that, as with the old style tin meter, the spuds are only soldered to the meter, there is more or less strain on the side when putting in the quarter. An example brought to my attention was where the prepayment meter in a small dwelling, set in the usual way, had "lost" its shelf; the people had probably burned it up for firewood. The quarter going in rather hard, they used a hammer, which broke off the spud. Someone stopped the leak with a potato, and then the potato fell off. There was one fatal asphyxiation and three pretty dangerous approaches thereto.

Mr. Weisgerber—As to the foreign population situation, I am at present located in a city in which 32 per cent. of the residents are strictly foreign, of which we figure about 22 per cent. are foreign born. The subject of bad debts has been mentioned. When I went to one city our bad debts were unnsually high. After the prepayment meters had been reduced from a little over ½ to about $\frac{1}{12}$ of the total number, our bad debts were brought to less than $\frac{1}{5}$ the former amount. Looking over our complaint book showed 21 complaints in one week in regard to meters. Most of them were due to prepayment meters. We found that the attachments stuck and needed adjusting. It stands to reason that if you have a regular meter and no quarter attachment, it is going to be cheaper to take care of it. I was always a firm believer in guarantee deposits, but do not believe a company can establish a blind rule in regard thereto. It is better to give credit to a man who owns no property, but is an honest man and pays his debts, than to ask him for a guarantee deposit. Some companies go so far as to say that we should have a guarantee deposit from everybody who is not a property owner. I would rather trust some of those men who do not own property than those who do. There is no more important man in the commercial end of the gas business than the credit man. He can do more harm or more good than anybody else. In a city in Connecticut, where there are 27,000 prepayment meters, the average of meters robbed was about 7 per day for a year. In another city the Board of Health requested the Legislature to pass a bill prohibiting the use of prepayment meters. This has either passed or is up for its second reading in the Legislature, and a number of gas men who are acquainted with it are watching the outcome. I also believe that in Los Angeles, Denver, and a number of other towns controlled by the American Traction Company, practically no prepayment meters are used. Los Angeles has a tremendous floating population. In Lynn, Mass., with over 4,000 prepayment meters, after carefully investigating the subject, they removed every one, taking off the prepayment attachment. It cost an average of $4 per meter to do this, or $16,000.

The President—Mr. Weisgerber will consider himself thanked. Next is the paper, by Mr. J. A. Perry, of Omaha, Neb., on

METHODS OF INCREASING EFFICIENCY OF EMPLOYEES.

The purpose of this paper is to outline briefly some general methods of increasing the efficiency of employees of gas companies. It is of the utmost importance to a company of any size that it be organized into proper departments with competent heads and subordinates, each man of authority requiring and expecting his subordinates to be energetic and interested in their work, they in turn requiring and expecting their clerks, foreman and men to be interested and putting forth their best efforts.

The payment of the best wage possible, with reasonable hours for all classes of work, is probably of next importance, as it will allow the weeding out of undesirable men, and will, with a strong organization, make possible the employment of a high class of steady men for each kind of work.

It is now well recognized that, to secure the best results, all large corporations must adopt some system of pension and of retirement for old and faithful employees, for, regardless of his position, it will encourage an employee to put forth his best efforts, to hold his position for the future benefits. The prime requisites are:

1. Good organization, with competent men in charge of the various departments.
2. Best of wages with reasonable hours.
3. Care of old and faithful employees by some system of pension and retirement.

Assuming that these requirements, at least, are met, the question arises, what methods can be adopted to increase the efficiency of employees?

1. It is essential that some care be taken to fill the positions of authority and responsibility with men who are vigilant, thorough, prompt, energetic, quick to act and determined; men who have ideas and the initiative and force to put them through.

2. Systematic instruction. As a rule a man's knowledge of whatever kind it may be determines what he shall do and what he shall leave undone. It is essential, therefore, that systematic instruction be given to all employees.

3. In the selection of employees, much can be done to secure high efficiency by selecting men who are young, willing, bright and active. The selection should not be confined to men who present themselves for employment, but care should be taken to locate other sources of supply.

4. Meetings of employees for instruction, and also for encouraging talks and lectures.

5. Wherever possible, work should be standardized and printed instructions issued.

6. Constant study and effort by those in authority to reduce lost motion, red tape, and time will cause work to be done more promptly and cheaply.

7. Some method of rating employees into classes, such as "excel-

(*Continued on page* 138.)

THE AMERICAN GAS LIGHT JOURNAL

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

A. M. CALLENDER & CO., - - Proprietors.

THOMAS J. CUNNINGHAM, ELBERT P. CALLENDER, } Editors.
H. THURSTON OWENS, - Associate.

CHARLES H. WADELTON, Manager.

Agents—American News Co., 11 Park Place, New York City.
Lemcke & Buechner, Berlin, Germany.
Aug. Siegle, 30 Lime Street, London, England.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico, $3 per year. Canada, $4 per year. All other countries, $5 per year.
Single Copies, 10 Cents.

NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, AUGUST 26, 1912.

BRIEFLY TOLD.

THE JOINT PROGRAMME, CURRENT MEETINGS, CANADIAN AND MICHIGAN GAS ASSOCIATIONS.—Here are the details given in barest outline of the named meetings:

Canadian.—Fifth Annual. Place and date, Toronto, Ont., September 3d and 4th. The business meetings, which will be called promptly at 9 A.M., will be carried on in the hall of the Engineers' Club, 94 King street, West. Order for Tuesday, Sept. 3d Meeting:

Register at Engineers' Club and get souvenir identification badges. Routine business. Presidents address, and these papers: "Reconstruction of an Old Retort House," by Mr. Howard E. Mann; and "Suggestions for Increasing the Industrial Use of Gas," by Mr. H. E. G. Watson.

A recess (to last from noon until 1 P.M.) for luncheon here is listed. For the afternoon the paper list provides for these numbers, in this order:

"Consumers' Accounting and Records System," by Mr. J. J. Armstrong; "Medium High Pressure Gas Distribution in Montreal," by Mr. C. H. Osler; "Gas *vs.* Coal for Water Heating Appliances," by Mr. C. W. Allman; "Commercial Lighting in Toronto," by Mr. W. I. Fuller.

The second day (Sept. 4th) will thus be taken up: 10:30 A.M.:

A business meeting of the Association, commencing at 10 A.M. At 10:30 members and friends (including ladies), holding Association badges, are to be guests of the Entertainment Committee, who, through the kindness of Mr. Arther Hewitt and the Directors of The Consumers' Gas Company, are to provide sight-seeing busses to take the visiting members and friends of the Michigan Gas Association, also to be in session in Toronto on Sept. 4th, aboard the steamer "Rochester" at the docks of the Richelieu and Ontario Navigation Company. Thereafter the members and friends of both Associations, including ladies, will be entertained as follows:

Motor bus trip to Station B. Plant of the Consumers Gas Company, where a short tour of inspection will be made. Thence to the city for luncheon. Thence on a sight-seeing trip through the Queen City, arriving at the Canadian National Exhibition Grounds at about 4:30 P.M. There the party will be taken to the Gas Show Building, where an excellent display of gas appliances will be on exhibition. After the visit to the Show, the party will then be free to visit the many other attractions at the Exhibition Grounds, until 8 P.M., when they will again be the guests of the Entertainment Committee, who will provide reserved seats in the grandstand for the evening vaudeville performance and display of fireworks. The official programme of the Canadian Association will be concluded Wednesday evening.

The programme of the Michigan Gas Association is thus arranged: The dates are September 4, 5 and 6:

Wednesday, Sept. 4 (early A.M.).—Arrive in Toronto by sleepers from Detroit and other points East and West. Go direct to steamer "Rochester," at docks of B. & O. Navigation Company. Send baggage there also. The C. P. R. has arranged for extra cars and special rates from Detroit to Toronto, leaving 11:40 Sept. 3, arriving 8 A.M., following day. Secure these through A. E. Edmonds, 7 Fort street, Detroit, prior to Sept. 1.

Eight to 10 A.M.—Register on boat immediately on arrival in Toronto, and receive identification badges and particulars respecting programme. This is important.

Ten to 12 M.—Sight-seeing, visit to gas works, automobile ride, luncheon, all at the thoughtful courtesy of the Canadian Gas Association.

Afternoon.—Visit to the Canadian National Exposition, including inspection of the gas appliance exhibit.

Evening.—Occupy special reserved sections of grandstand for fireworks' display at Exposition.

September 5th, 6 A.M.—"Rochester" leaves dock for 2 days' trip; breakfast aboard, 8:45 A.M.; arrive at Youngstown, for side trip to Niagara Falls; 9 A.M., leave Youngstown (Gorge electric line) for Falls, arriving there at 10:15. Leave Falls, arriving at Youngstown at 4:15 P.M, and continue trip to Thousand Islands; 8 P.M., business session on boat.

September 6, 6:30 A.M.—Reach Thousand Islands, pass through and reach Ogdensburg at 10:30. After an outdoor box lunch, at 1 P.M., the return to Toronto through the Islands is taken up. In the evening a second business session is held.

September 7th.—Toronto is reached at 5 A.M.; an early breakfast is served on the boat, and members can get early trains, either west or east. These papers will be read:

"Gas Versus Coal for Water Heating Appliances," by Mr. D. W. Allman.

"Increasing Sales of Gas Appliances by Special Campaigns," by Mr. Philip Buckley.

"The A. B. C. of Gas Company Advertising," by Mr. Richard Fowler.

"Variation in Heat Units in Condensing and Scrubbing of Coal Gas," by Mr. A. I. Snyder.

"The Electrical Separation of Tar from Coal Gas," by Prof. A. H. White, Messrs. John W. Hacker and Frank Steere.

"Large Profits in Small Economies," by Mr. T. J. Weber.

"Gas Collections," by Mr. F. J. E. O'Hara.

THE PARKER-RUSSELL COMPANY'S EXHIBIT, MICHIGAN-CANADIAN ASSOCIATIONS' JOINT MEETING.—The Parker-Russell Mining and Manufacturing Company, of St. Louis, Mo., wishes to say: At the joint session of the Michigan and Canadian Gas Association to be held in Toronto, Canada, the first week in September, the Company has decided to make a small display of its products at the Canadian National Exhibition, which also takes place that week. The Commissioners have provided a building for gas exhibits, and the Company believes a very creditable display of gas appliances will be made. Of course gas men attending these meetings will hardly require such intimation, but they will be gladly welcomed at the Parker-Russell booth.

PERSONAL.—Mr. Leon Gaster, Editor of "The Illuminating Engineer," London, England, returned to Europe on the "La France," Thursday, the 10th inst., after a visit of a month to this country. It was largely due to the efforts of Mr. Gaster that the interest in the subject of illuminating engineering has received so much attention in recent years in England. In addition to his work as an Editor, he has delivered a number of valuable lectures, amongst which were the "Cantor Lectures" on that subject, in 1909. He is Honorable Secretary to the British Illuminating Engineering Society.

CURRENT MENTION—

MR. ROBERT E. FREEL, who succeeded Mr. Alfred Montgomery as Assistant Superintendent of the Clinton (Mass.) Gas Light Company, the latter having been promoted to the management of the Leominster (Mass.) Company, is surely "making good." Although that is hardly to be regarded as "news," for his friends were all satisfied that he would "make good."

THE Fall River (Mass.) *Globe* recently had this to say about Mr. F. M. Roberts: "Frank M. Roberts, Manager of the commercial division of the Fall River Gas Works Company, has been promoted to the General Manager's post with the Haverhill Gas Light Company, succeeding Mr. Thos. Nickerson. Mr. Roberts has had long experience in all divisions of the gas business, being one of a very few men in the country able to qualify as an expert in the manufacturing as well as the commercial end of the industry. He came to Fall River, from Mount Vernon, N. Y., in January, 1910, and, as Manager of the commercial division of the Fall River Company, introduced many modern improvements, and has seen the business rapidly extended under his personal direction. Among other things, the Company has built and taken possession of its new offices since Mr. Roberts came here. He first entered the gas business in the Philadelphia works of the United Gas Improvement Company, and was rapidly advanced, serving the U. G. I. folks in Atlanta, Ga., Yonkers, Portchester and Mt. Vernon, N. Y., before coming to Fall River to take the position of Commercial Manager in the employ of Messrs. Stone & Webster, the well-known Boston Corporation which controls the plant in Haverhill as well as Fall River, and in several other cities throughout the country. He will close up his business in Fall River as speedily as possible, and believes he will be ready to assume his new duties in Haverhill by September 1st. He has made a host of friends during his stay in Fall River, his business and social relations having been of the pleasantest sort. While his friends here will congratulate him on his deserved advancement, at the same time they regret to see so progressive a man leave the city for another field."

IT is positively asserted that the authorities of Edmonton, Alberta, will next year construct a modern gas plant (to cost considerably in excess of $300,000) in that city, to be owned and operated by the municipality. According to a civic census, taken last spring under the direction of Mr. Robert Hamilton, Edmonton had then a population of 53,383.

A CORRESPONDENT in Cambridge, Mass., writing under date of the 18th inst., incloses this mention: "The staff of the Cambridge Gas Light Company has been given pleasing information that the corporation has determined to distribute a cash bonus to all who have been in the employ of the Company since the first of the year. In keeping with its progressive policy the Company has taken up the matter of a profit sharing system, believing that such a plan tends to give the employees a greater interest in their work, by helping them to realize thay are part and parcel of the Company, thus eventually resulting in greater economy and more profit to the Company, coupled with better service to the public and decided financial benefit to the employees. If the results are satisfactory the plan will be continued from year to year. At a recent meeting of the Directors it was voted to distribute to their employees who seemed eligible a bonus of 5 per cent. of the wages received during the fiscal year, ended June 30th last, as appreciation of loyal and efficient work. The details of the distributing are now in the hands of a committee, and the awards will probably be announced by the 1st prox. A recent dividend of 5 per cent. on the $200,000 additional stock of the Company was paid to shareholders and subscribers, and so the prosperous condition of the Company's finances led to the consideration of a plan to allow faithful employees to share in the profits. There are about 200 employees, and the bonus paid will amount to approximately $10,000."

THE City Council, of Omaha, Neb., in a special session some days ago, adopted a resolution instructing the Board of Public Works to collect information as to the advisability of engaging the city in the operation of a gas plant, also to determine the probable cost thereof. Our informant in this respect concludes his presentations by remarking that, "The supposition is general here that, this project is of a retaliatory nature, in that the competition that is going on between the municipal electric lighting system and the electric system of the Fremont Gas and Light Company has reached a very acute stage."

THE net earnings of the Hartford City (Conn.) Gas Light Company for its last fiscal year (ended June 30th last) exceeded those of the previous year by $12,006.

THE Hamburg (Pa.) Gas and Electric Company has been awarded the contract for equipping the large, new foundry in West Hamburg with power. This Company will also receive the contract for the lighting of the buildings of the new State sanitarium, east of town. Its plant is now in first class condition.

THE Twin State Gas and Electric Company, of Dover, N. H., has taken over by purchase the properties of the Berwick and Salmon Falls Electric Company. This purchase includes the acquiring of some valuable water power rights.

THE Philadelphia and Suburban Gas Company will construct a gasholder up to retaining 3 millions cubic feet at its sub-station in the western section of Chester, Pa. The Company's output is growing out of all proportion to the best fore estimates of its proprietors.

WATSONTOWN, PA., will have a gas supply sometime prior to October 1st. This settlement, the population of which numbers 2,000 or more, is on the Susquehanna river some 4½ miles north of Milton. From the latter place a 4-inch, high pressure main into Watsontown, has been laid, the work, of course, being under the direct supervision of General Manager W. H. Rhoades.

MR. I. W. PEFFLEY, Eastern Sales' Agent for the George M. Clark Company, is again spending his vacation timo in far-away territories. This time he is roaming (maybe ranching) in far away Texas, and will likely miss the Michigan-Canadian joint meeting. "Peff." was always strong on this Michigan trip; but perhaps he may act on the "recall order," and be there, just the same.

THE New Jersey State Gas Association will hold its Fall meeting in Atlantic City, Sept. 21st. It will be a 1-day session, and it should draw well, for Atlantic City is very attractive during the noted time of the month. Further, the management of the Atlantic City Gas Company has provided a session room in its handsome headquarters for business, and where all the newest things in lighting appliances for the fall season will be displayed. President W. H. Pettes and Secretary A. H. Osborn will be assisted by Mr. J. C. Lightfoot, Chairman of the Committee of Arrangements, and Mr. Dubois, of the local Company, who will have charge of the exhibits.

THE residents of Hebronville, Mass., which is not so very far from Attleboro, Mass are anxious to secure a gas supply, but the nearest "regular" gas company does not feel that it would be justified in extending its mains to and through that section. So, in despair, they have asked the acetylene central station in South Attleboro to come their way. Better not, gentlemen.

AT a meeting of the shareholders of the South Delaware Gas Company, held in Seaford, Del., a week or so ago, the following officers were elected: President, Edgar C. Ross; Vice-President, Sydney Kenney; Treasurer and Secretary, Thos. E. C. Ross.

"F. H.," writing from Berlin, Wis., under date of the 21st inst., says: "Now, that the properties of the Berlin Gas Company have been taken over by the Public Service Company, Mr. Thomas B. Wood (better known as 'Judge,') who was with the Berlin Gas Company since its inception (1904), has severed his connection with the institution, to become identified with the Staunton (Va.) Gas Company. The citizens of Berlin are sorry over the 'Judge' leaving their city, for he was well-beloved by every man, woman and child resident therein. He surely shall be missed, since there was not a more persistent worker in our midst. It was mainly through his energy that we have one of the best hospitals in the State, and he is the father of several lodges now flourishing in Berlin. We all wish the 'Judge' every possible success in his new field."

MR. AUGUST G. VOGEL, recently in the service of the Consolidated Gas Company, Baltimore, Md., has been appointed Sales Manager for the Meek Oven Company, Newburyport, Mass., manufacturers and designers of gas apparatus.

Publications.

[All Publications, Catalogues, etc., mentioned below, are kept in our office for the convenience of our patrons.]

Company Membership.—The National Commercial Gas Association has issued an attractive pamphlet describing the advantages of company membership in that organization. The work of the Association, although expanding rapidly in scope, is nevertheless meeting the demands of the industry in an effective manner. Those companies not already enrolled should go in at an early date.

Gas Progress.—A magazine for users of gas for lighting, heating, cooking, etc., published quarterly by the *Gas World* for distribution by British gas companies among their consumers. The magazine contains timely articles showing the advantages of gas, and carries advertisements of many of the leading appliance manufacturing companies.

(*Continued from page* 135)

lent," "good," "fair" and "bad" should be adopted. Those in the "fair" and "bad" classes should be carefully instructed, and if they do not improve, they should be dropped for new material.

8. Other specific methods to suit various classes of work will probably be found effective. To bring out any such methods in the discussion of this paper, is my purpose.

Discussion.

Mr. Weisgerber—I spoke on this subject last year. Hardly anyone who visited our company has failed to comment on our excellent organization. When you can get a helper to come in with an order for 30 arc lights from a department store, your employees are doing some good. By grading them in classes we always keep a force of competent men.

Mr. Bertke—This subject is so broad that it is a hard one to discuss. Every man has his own system respecting the way he treats his men. I don't agree with Mr. Perry that you should have written rules for everything, and have them before the men at all times. I believe the less red tape and the fewer rules you have for the men the better it is for them. It is not hard to get conscientious and honest men, and all men of this kind require (if they are treated right) is to find out what the company requires of them, and they will do good work.

The President—I am glad to see this broad-minded humane way of looking at things. You may write rules until kingdom come and never get any efficiency. Treat your men as men, carrying out the Golden Rule as nearly as possible, and you will get efficiency and honest work with loyalty to your company. I believe that is the keynote to the whole situation.

Mr. Vincent—When we think of increasing the efficiency in any operation, all have in mind lowering the cost of production; but that does not necessarily apply to the gas business, for in our business we are doing two things—producing gas and making installations; and we are also, as has been said here a number of times, selling service. You can increase your efficiency by bettering the service and greatly benefit your company, and not neeessarily decrease the cost of your production. I can illustrate that by an example. Suppose you are operating a fitting shop through which are going 200 orders of various kinds each day. The shop is so operated that those orders are finally completed for the customer in anywhere from 3 to 5 days after they have been received. Suppose you change the organization so arranging that they will all be completed the same day; it will cost you a little more to do the work, but undoubtedly you have increased the efficiency. I am not in accord with the idea of having a large quantity of written rules, at least not in that sense. Our employees should be familiar with our rules, and should not be advanced to higher positions until they are familiar with all the rules of their new job. In other words, the knowledge of the rules and regulations governing their work should be as much a part of the days' work as the mechanical work itself. Written rules should be concise and to the point. For good men, written rules should be more in the nature of a reference work than rules for rigid guidance. If you fill the workman's mind with a lot of "Does" "Dont's," more or less irrelevant, you certainly won't increase his efficiency in his actual work performed.

The President—I don't know where there is a more competent manager than Mr. McLean, and we would be glad to hear from him.

Mr. McLean—On the train the other day, when the conductor asked me whether I could make change for $5, I fancied it a compliment. I don't know precisely what it is the President has said concerning myself, but whatever it is, I thank him for the compliment. I have in mind, Mr. President, a manager who, on Christman eve, received an easy chair, the gift jointly of the employees of the office and the employees of the shop. I believe this action on the part of the men indicated in a substantial and very beautiful manner the attitude of those employees toward the men to whom they were responsible, but I think it also indicated the way in which the employer had treated them. He was competent, but nevertheless I believe he had put into effect that policy which the President has so well indicated should be applied. I think the President put it all in a nutshell; that is to say, he treated those men as men, and by giving them the consideration to which they were entitled he obtained the loyalty to which he was entitled. I think that is all there is to it.

The President—I knew I would make no mistake in calling upon Mr. McLean, and I am sure we have all been delighted with his remarks.

The Convention thereupon adjourned to 2 P.M.

SECOND DAY—AFTERNOON SESSION.

The President introduced Mr. H. C. Blackwell (Davenport), who read a paper on

SURFACE COMBUSTION.

[For the text of the Blackwell paper, see JOURNAL, page 90.]

Discussion.

The President—Mr. Blackwell has taken a great deal of time to prepare this paper, and has illustrated the subject extremely well. Certainly, some expression of thanks is due him. [On motion of Mr. Vincent a hearty vote of thanks was tendered Mr. Blackwell.]

The President thereupon introduced Mr. R. K. Runner (Charles City), who read the following paper on

THE CONSTRUCTION AND OPERATION OF A MODERN WATER GAS WORKS IN A SMALL TOWN.

When the writer, at the request of the Council, consented to prepare a paper on this topic he did so with the feeling that there was nothing new he could offer along these lines; but as the thought occurred that the range of the subject assigned is wide enough to take in every field of experience, I shall not try to go into non-essential details and to be as brief as possible.

At the beginning I have to say that, in the average town of less than 5,000, especially so in one which is conservative, and does not have absolutely sure prospects of a healthy, steady growth, you cannot successfully get the business necessary to support a modern gas works. By modern I mean a plant complete in every detail, having storage capacity ample to care for at least all current demands to be made upon it, with necessary equipment to permit of economical operation, and enabling one to obtain accurate knowledge of working conditions daily at the plant, as well as the amount of gas sent out per diem.

In the construction of this small, modern, water gas plant the first requisite is to have a town large enough to properly support the enterprise and make it pay; and there are not many such fields unoccupied. Any town selected should be growing or have prospects for immediate future expansion, preferably with some industrial enterprise in prospect. The works of such a plant should be located with proper drainage, and adjacent to a railroad siding. All machinery should be housed in fireproof buildings, capable of holding necessary duplicate sets of apparatus as soon as the business demands. For this plant the writer is inclined to a low pressure distributing system. In order to be of good construction, and to keep down street leakage, the main system should be of full-weight, wrought iron pipe, with expansion joints on all specials, and sleeves located at street intersections, standard recess screw couplings being used elsewhere. All pipe should be well painted with pitch thinned with coal tar, in which the acid has been cut with unslaked lime. This to be applied with iron and pipe both hot. All service should be of the same kind of pipe, painted in the same manner; 1¼ inch being the minimum size of service used. All service taps to be made on side of main, and service clamps or saddles used when tapping 2 and 3-inch pipe. This main system, as to size of pipe laid, should be well balanced, using 2-inch pipe as the minimum size of main, with 8 inch leading from the works. I would also build the gas works 8 inches throughout, and this would include a 3-piece water gas set, scrubber, condenser, and at least a 10,000 cubic foot relief holder, exhauster, washbox, 2 purifying boxes, station meter, 50,000 cubic foot storage holder, and station governor; all connected with proper by-pass valves, yard and drip connections. One 60-horse power, horizontal, tubular boiler, equipped with shaker grates, with tar supply system to include 1 injector, 1 boiler feed pump, 1 engine, with blowers and oil pumps in duplicate, and an oil unloading-pump if gravity system cannot be used; also, if feasible, your own well and water works system—all this, together with suitable fuel sheds and oil storage tanks, to enable the storing of at least 3 months supply of fuel and oil. It would also be necessary to have a proper tar separator and storage capacity, and a wise provision would be to have a plot large enough so that a future holder could be built. This would constitute a modern water gas works for a small town, and the construction (including 10 miles of main), with no untoward local conditions would take 3 to 3½ months to build and put in operation.

The plant is to be arrauged so that the works can be operated by one man, it should have the boiler room located between the machinery room and that containing the water gas set, the purifiers being located in a separate room, divided from the main part of the building by a solid, fireproof wall, extending through the roof where these

buildings are not separate. The gas machine should be operated from the floor, it being necessary for the gas maker to occupy the charging floor only when occupying the mechanical hoist to supply fuel to the generator, or when cleaning his machine and attending to the oil spray. The securing of results in operation depends upon the size of the output, which is small to begin with, and the number of hours necessary to run the water gas set, granting that all operating conditions are normal, for the fuel used to bank fires and to start up is the same in all cases, it being self-evident that results can be improved as the output increases. Every engineer does not see fit to balance his plant in the same manner as regards water gas set and holder capacity; but, with the holder capacity described, we decided on a 4-foot 6-inch gas machine, which has the advantage of making it possible to repair or replace generator linings than in the case of a smaller machine; moreover, not having to do this so often, the expense is less. This will also put off the time when a duplicate water gas set is required.

With the size plant here described, we, at Charles City, are at present making gas 6 hours per day, with the following working conditions on our gas machine: 16 to 18 inches blast pressure; 35 pounds steam on the generator; 50 pounds oil pressure at spray nozzle, with 5-minute blast and 5-minute run; oil on, 4 minutes. We are averaging over 2,100 cubic feet per run, with coke as generator fuel, showing the following results: 42 pounds of coke and 3.7 to 4 gallons oil per 1,000, using for boiler fuel 3-inch screenings, which it is possible to do with the rocking grate under the boiler. We are running 42 pounds of steam coal per 1,000. The pounds per 1,000 of steam coal used can be reduced by the use of a higher grade of fuel, but the cost would remain about the same. In a works of this size one man can make 100,000 cubic feet of gas per day, extra labor being needed only for the unloading of coal and coke and the changing of the purifiers; this last is necessary about once in 6 months. The flow of gas in these boxes can be reversed, and they are also arranged so that a box which is first one time can be put in the series after it has been changed.

The writer's experience of the past few years has been in towns of from 5,000 to 8,000 inhabitants, which, with a water gas plant, would require the following working force: In the office the work will be done by one person, presumably a young woman, and, in addition to the superintendent or manager, the regular male help would be 1 gasfitter who would take statements and do complaint work, which would not take all of his time, one all-round street man and gasfitter, who is able to make gas when necessity requires, and, most important of all, a good gas maker. In the busy season extra gasfitters and laborers for service and main work would be temporarily added to the crew. Part of the year at least it is an excellent investment to employ a new business man or solicitor, and, while he gets the business, it would pay to keep him. It is all important that he gets his orders clean cut and clearly written, with no comebacks and cancellations. And while he is on the job it is an advantage to have him look after the fitters doing the work for which he has taken orders. It is also an excellent policy, even in a small plant, to require the consumer to sign a service contract and meter application, or, if those do not cover the installation ordered, have him sign range rental or or other material contract for all work to be done. This does away with the possibility of misunderstandings and enables checking up your solicitor's work. It is all important that no work is done by any fitter except on written orders from the office, which orders should be properly filled out and returned upon completion of work.

In advance of the construction period in a new plant it is important to have all the details of office system and records worked out and provided, ready to put into operation as each stage of the work advances to the point where they are needed. In our practice field notes are kept on all mains laid, giving accurate depth of all specials, summits and drifts, from which office main records and maps can later be brought to date. Each service order, when finished, is in itself a complete record of the size, location and depth of material used, with a sketch showing relative location of buildings and services to property lines, also indicating the grade of each service. These service orders are made out and numbered from the service and stub record book, and they become the office record of the work. The system of bookkeeping necessary for such an office is comprised of: First, the general books always necessary; that is, cash book, journal and ledger; in addition, the auxiliary gas consumers' ledger, also petty ledger, which, with its bill and charge blotter, is to take care of merchandise accounts.

The gas consumers' ledger is a loose-leaf book, with a leaf for every meter, which leaf is always used for the same location regardless of any change in tenants, the two pages covering a period of 8 years. This ledger shows the service number, name of each consumer during the period covered at that location, when the meter was set or removed, tested number, size and kind of meter (using only the companys' meter number), also giving meter statements each month and showing consumption with date that bill was paid.

The petty ledger is also a loose-leaf book, and when the monthly trial balance is taken the total of its debits should equal the debit balance of the individual ledger account in the general books.

Bills for merchandise are made out on a bill and charge form, the original of which is mailed to the customer at once after the work is done, the carbon copy being the office record for which postings are made into the petty ledger. Each month's business is recapitulated and charged to individual ledger account, giving merchandise proper credit in the general books.

The classification of accounts used in the general books of this small plant will of necessity not be as elaborate as those usually pre scribed, but to be accurate statements of the business should consist of the following:

Manufacturing.—Generator fuel, boiler fuel, oil, supplies, manufac ing labor, purification labor, tar account.
Distribution.—Office expense, office rent, office salaries, distribution labor, distribution supplies, street lamp operation, stable.
New Business Expense.—Expense, office, advertising, soliciting new business, subscriptions.
General Expense.—Special expense, interest, insurance, taxes, legal.
Extension.—Buildings, new; mains, new; services, new; meters, new; street lamps, new; apparatus and machinery, new.
Maintenance.—Buildings, mains, services, meters, street lamps, apparatus and machinery.
Furniture, Fixture and Tools.—Office fixtures, etc., maps and record books, etc., vehicles and tackle, coarse tools, fine tools.
Merchandise.—Ranges, Welsbachs, fixtures, piping, stock, pipe and fittings, stock manufacturing, supplies.

Following these come the many memorandum and record books, the number of these to be fixed by the requirements of each separate office system; but economy in office work dictates that these shall not be too burdensome and overloaded with details, but at the same time they should be complete. Omitting the elaborate details and cost curves which are necessary to a large office, the following are the record books which in our system are required as additional memorandum blotters:

1. Consumers' cashbook, into which all gas bills paid are entered, the totals only being carried on the general cashbook crediting gas account. This enables the bookkeeper to take care of her cash, to check gas bills as paid with accuracy.

2. The gas register, used for convenience in getting the number of cubic feet and amount of the monthly gas sales, the separate accounts of which are carried on to this book consecutively in abbreviated form from the consumers' ledger. From it we get the recapitulation showing the total amount of gas sold through standard meters, the total amount of gas sold through prepayment meters, total sales for the month, gas used at the works, and at the office, number of bills, average gas bill, and the average selling price of gas for the month. After the gas bills are paid they are entered into the consumers' cashbook, from which they are checked as paid concurrently on the gas register and consumers' gas ledger. The gas register has one great advantage in that it shows, at a glance at any time, those gas bills which are unpaid, and at the end of the month a delinquent list is made from this register to do which requires about 15 minutes of the bookkeeper's time.

3. The route-book, showing name of consumer, meter number, location, etc., is for the statement taker. Gas bills are made out from consumers' ledger during the middle of the month, including everything but the last meter reading and extension. When meters are read, lest readings are carried onto the gas bills from route-book, consumption is figured and extension made with the aid of rubber stamps. Statements are then also carried from the route book to the consumers' ledger, and from the consumers' ledger to the gas register. Gas bills when finished, and before being sent out, are checked for error with the gas register and they are then ready to be delivered to the consumer. If a meter is read correctly, after this system of checking we never have a gas bill which is in error go out of our office. The gas bill itself is made out in three sections, the first two of which are identical. The first section is torn off and delivered as a statement to the consumer. We send these out by a man (gener-

ally the statement taker) who is expected to deliver them to the consumer's house or return them to the office if he is unable to do this. The remaining two sections are the gas bill and stub, or cashier's coupon, which are retained in the office and filed alphabetically, so that when a consumer comes in who has forgotten to bring his bill along no delay is caused by the cashier having to stop and look up his account in the books and then make out a new bill. Also, at the end of the discount period this saves much time and does away with the chance of not finding every item of an account especially if the regular bookkeeper is not waiting on the counter. When this system becomes burdensome, and the office work increases, an addressograph can be installed to reduce labor and save time.

4. Delinquent gas bill record shows the number and amount of gas bills unpaid, by whom they are owing, and for what months.

5. A piping-cost, record-book is kept, in which all fitting jobs are entered, and from which all pipe and fitting materials used are once a month charged to the several accounts, giving stock, pipe and fitting account proper credit for these materials. This book also enables one to check up the cost of each piping job, to see whether gas fitters are doing work at a profit or loss.

6. The service and stub record shows the total number of connections and amount and size of pipe used in each service and stub put in; and, in addition to the street number and location, each service or stub also has a service number assigned from this record, which number is important, as all records for work done at the location of each service are filed under this number which is never changed.

7. The monthly meter record book shows the number of meters in use at the time of the last meter balance, size and kind of each, number set for the month, total number in use, number and kind of meters in stock, total number of meters owned by the company, also the number and kind of meters purchased since the last meter balance.

8. The meter record proper is a card system, each card representing a meter and showing the date the meter is received, maker's name and number, company's number, size and kind, number of service on which meter is set, date set, also showing when removed or repaired. Cards for meters in use are in one section of the cabinet, and cards for meters in stock are in a separate section of the cabinet file, which enables one at a glance to know the number of meters in stock. All meters are tested with a standard meter prover when first received and immediately after being taken out of service.

9. A meter test record is kept which shows the name of the consumer to whom the test should be credited, whether "O. K.," and if not, what date repairs were made, kind and cost of them, and by whom made.

10. A record should also be kept showing the number of ranges, gas arcs and water heaters in use, and number of sales each year, giving name and location of consumer using same.

11. In connection with the work of the solicitor a card index, arranged by streets, should be kept, showing all the houses on the lines of the gas mains, with a card of one color for those houses using gas, on which can be compiled data showing number and kind of appliances in use; also, whether house is piped for gas or wired for electricity, and cards of a different color for those houses on the lines of gas mains which are not using gas; these also contain any data that may be of value.

12. The manufacturing record is one of the most important auxiliary books kept, is written up each day from the works' report, and should show: The cost of coal, oil, and coke used, also the pounds and number of gallons per 1,000 of fuel and oil used each day, together with final averages and totals for the month, including daily and average output, largest daily output, with street leakage for each month. In making up this record we correct the volume of gas made from temperatures and barometric pressure. This reduces the street leakage account that is not generally considered essential in small plants.

The gas maker should keep a record book at the works from which he makes his daily report, for this enables him to know what results are being obtained, and to locate any discrepancies at once through comparative daily results.

As to the details of operation in a small works each plant is a problem separate in itself, due to local conditions, such as general arrangement and size and kind of apparatus used.

As to the management. This comes in contact with each consumer personally, and the position requires more ability than is often needed in the organization of a larger plant. An error in judgment, as to a business policy or purchase of supplies and materials, will show up more quickly in the reduced size of the net income; also, any improperly directed effort at once affects the whole organization, including clientage, instead of only a small part of it. The man in charge must cover each detail of operations which, to be successful, means that no time must be wasted by giving undue attention to any one department or part of the business to the neglect or harm to the balance of the work. This I find is easily done. He should not lose sight of the fact that meters set and working are the objects to be obtained.

Among the consumers of a small plant the price of gas is always under discussion, as well as in a larger city. However, the price of gas must be high enough to enable the company to render first-class service; this is of great importance. The public should pay for all they get, and in the question of rates good service is a consideration as much as the price of gas is in every small plant. This increases the growth of the business, regardless of the price of gas. These are the most important items to note in considering this subject.

(To be Continued.)

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, August 10, 1912.

The Cost of the Coal Strike.—The Davis Stove Company and Tests of Gas Fires.—Spent Liquid from Sulphate Plant.

Stockholders in gas undertakings are awaiting, with more than the customary degree of interest, the reports and statements of the directors in respect to the working for the half year ended 30th June, because they are somewhat anxious as to the effect of recent troubles on the income, expenditure and profits. They know that there has been a period of unprecedented severity in the matter of coal supply, that not only was there practically a total stoppage for a period of 6 weeks, but great difficulty in securing the quantities guaranteed under contract during the preceding 9 months. And that the supply of gas was looked upon, by those who, for their own ends were promoting the disturbance, as one of the first inconveniences that would prove so intolerable, that the public would be forced to their knees, I leave them masters of the situation. It was assumed and hoped that the majority of the gas undertakings could not survive a stoppage of more than a fortnight, but as a matter of fact the cases of serious trouble, necessitating substantial curtailment of supply, were few and far between. Of course, there were some few who, for one reason or another, found themselves uncomfortably short as regards stock on the day that war was declared. Some stoutly denied the possibility of a stoppage at all, and others held that if it took place it could only last a few days, and that it was not in any sense an important contingency. But the greater part preferred to err on the side of caution. They could see, a year or two ago, that an obstinate and determined fight must come off sooner or later, and so it became the general practice to run not less than 4 and perhaps 6 or even 8 weeks stock. All this was well known to some, but others, not so fully informed, took alarm at the current quotations and at the statements issued by the daily press, and imagined that after satisfying the demands of the coal factors there would be a serious shortage in the balance available for dividend. The statements now being issued will be received with considerable relief as being of a reassuring character. Some are even able to say that they have made a profit out of the strike. Their whole requirements having been secured at contract rates there was no important increase in the price of coal, and they were able to benefit by the increased prices obtainable for coke. Others, not so well provided for, were obliged to secure additional supplies at current prices, as shown by the market quotations during January and February. But the quantity actually purchased at the panic prices quoted during the progress of the strike, and which ranged from double to treble the normal rates, formed too insignificant a proportion as compared with the whole year's supply, to exercise any important effect on the total. In no case has any concern been so seriously hit by the recent turmoil as to necessitate sweeping reductions of dividend, or an increase in selling prices. The greater part have, as usual, earned their full dividends by the years' operations. There is a great advantage when the hour of adversity comes, if it has been preceded by a period of prosperity, provided that due care has been exercised in the direction of making hay while the sun shines. And such was the happy position when gas undertakings

entered upon the troublous period from which they have now completely emerged. They had enjoyed a time of exceptional prosperity and had not failed to utilize the opportunities thus afforded for making provision for a rainy day.

The trouble has involved much more than a mere question of prices. The irregularity of supply, in some instances the very indifferent quality, by the use of materials having properties of a very different character to those ordinarily used, increased working and purifying expenses. Under normal circumstances it is possible to arrange supplies so that 80 or 90 per cent. of the cargo can be dropped directly in front of the retorts, and carbonized while fresh, without a second handling. But with irregular supplies a much larger proportion goes into store, necessitating a considerable amount of extra handling and trimming, and some of it remains a sufficient time in the stock to suffer serious depreciation. Some coals, particularly those of a soft kind, will be greatly prejudiced by a month or two in store. Then there is at present a much smaller quantity of yard and colliery sweepings, refuse tips, etc., than existed six months ago, the balance having in some form or another found its way into the gas works yard and been paid for as good quality gas coal. It was impossible during the panic to get any guarantee of quality, and some merchants took the precaution, not unnecessarily, of protecting themselves by a notification to that effect on their waybills. The result was not only deficient yields of gas and coke, but more work for the purifiers to do.

As a consequence of the strike there has been some delay in respect to arrangements for the ensuing 12 months. The strike clause in general use provides that, in the event of cessation of supplies from any cause, the period of stoppage shall be added at the end of the contract term. In the case of a contract terminating at the end of June, the extension on account of the six week's stop would carry it well into August, and many naturally prefer to close up the old before entering upon new responsibilities. A second cause tending to make some hesitation has been the strong endeavor to utilize the rush that followed the recommencement of supplies as a lever for permanently lifting prices. At one time an advance of 5s. was talked of and then there was a determined attempt to make a stand at 2s. 6d. But wiser counsels have prevailed, with the result that many contracts are being renewed at an advance of 1s. to 1s 6d. on last year's prices. I say wiser counsels because the gas industry is not in the humor after last year's experiences as to uncertainty of supply to tamely accept a large advance. The present is anything but an opportune time for such a step after the experiences detailed in the preceding paragraph. That some increase is warranted by the new regulations at the coal mines, is generally admitted. But it is thought that the limit of 1s. 6d. is ample to cover this, and there is a strong objection to pay more. On previous occasions when an advance equivalent to perhaps 6d. per ton on the cost of the coal has been experienced there has been a disposition to take anything up to 2s. 6d. out of the consumer. It will be a great mistake if these tactics are repeated at the present juncture.

The Davis Gas Stove Co. of London have originated a very ingenious method of testing the efficiency of gas stoves. There is a very common prejudice to the effect that a gas fire must necessarily be unhealthy. Some people who tolerate them in an office or occasional room will not have them in a bedroom on any account. They suppose that a quantity of the products of combustion, complete or incomplete, must necessarily escape and contaminate the air of the room. Messrs. Davis have rendered an important service to the gas industry, first by showing that this need not necessarily be the case, and second by designing a simple means by which a conclusive proof can be taken, and placed on record, of the efficiency of any make of gas fire in this respect. There is no elaborate apparatus or manifestation about the process, which can be worked in a reliable manner by any person capable of operating a photographic camera and an optical lantern. It is based upon the well known facts, that the products of combustion contain a considerable amount of steam or water vapor and are appreciably hotter than the atmosphere, and that the steam will condense in a visible form on a cold glass plate. A common illustration of this fact is afforded when a glass tumbler filled with cold water is carried into a warm room, or by the condensation of water on the inside surface of a glass window in an apartment appreciably warmer than the outside air. The gas fire to be tested is placed sideways in front of a wire screen, in such manner that the shadow can be projected by means of an optical lantern. A sheet of plate glass is shaped to fit the front of the fire, the bottom edge being flush with the bottom of the canopy, and supported in the middle of the front and at right angles to it, and therefore parallel to the screen. The gas fire having been lighted and in normal operation, the glass plate is carefully dried and cooled if necessary to a mere trifle above the atmospheric temperature in the testing room. If the gas fire "draws" as it ought to do, no products escape under the canopy at the front, and the glass plate remains clear and dry. But if any fumes pass in contact with the glass plate the same is blurred by condensed moisture, and a decided shadow is seen on the screen. By the aid of an ordinary photographic camera a permanent record of the efficiency or otherwise is thus afforded, and tests can be conducted with varying quantities or qualities of gas, or with various lengths of flue pipe attached to the stove. The capabilities of this simple test are very numerous. The same enterprising firm, as may be mentioned, are in the habit of supplementing laboratory tests of new patterns of cooking fires, boilers, etc., by actual working tests in a dwelling house under everyday conditions.

The question of the disposal of spent liquids from sulphate of ammonia plants has been attracting considerable attention lately, not so much on account of the operations connected with gas works as the very large quantity of such liquids produced at coke and power gas manufactories. The quantity of waste liquid from coke ovens, when the impurities in the gas are collected and utilized, or from power gas plants, are very much larger than those at coal gas works. It is assumed that such liquids are both actively and negatively poisonous. The tarry matters contained in them are said to exercise a prejudicial effect on fish, and the chemicals present are alleged to absorb oxygen, and so interfere with the process of natural oxidation, by which objectionable organic matters introduced into a stream are in course of time rendered innocuous. But there is very little positive evidence of serious injury. The question really resolves itself in to the necessity or otherwise for a purification treatment. Mere settlement to remove suspended matter does not meet the case. As a rule, the manufacturers are strictly forbidden against turning the liquid into the town drains, because if the drainage authority do not use bacterial or chemical means of purification, they are subject to restrictions as to the character of the effluent. When bacterial beds are used, a stringent watch is always kept against refuse that may possibly interfere with their action. The liquid cannot be turned direct into streams, water drains or rivers. It is said that it can be treated by a bacterial process. One or two gas works use a chemical purification process, others use the spent over and over again, or run it under the furnaces. Sometimes the difficulty is enhanced by the use of large quantities of steam, which, while it dilutes the liquid, increases the bulk.

Mechanical Draft and Boiler Firing.

The United States Bureau of Mines makes the statement, in a recent "Bulletin," that the present steaming capacities of steam boilers can be tripled or quadrupled by forcing over the heating surfaces 3 or 4 times the weight of gases now passed over them. The "Bulletin" declares:

"With well-designed mechanical draft apparatus this greater weight of gases can be forced through the boilers at small operating cost. It is possible to increase the capacity of many of the present boilers in this way without reducing their efficiency much; in fact, by proper arrangement of the heating surfaces, the efficiency can be made higher than the present rating. The efficiency of any boiler can be increased by arranging its heating surfaces in series with respect to the path of hot gases. New boilers of high efficiency can be constructed by making the cross section of the gas passages small in comparison with the length."

These statements are contained in "Bulletin 18," the "Transmission of Heat into Steam Boilers," the authors being Henry Kreisinger and Walter T Ray. The investigation of the transmission of heat into steam boilers is one of several researches now being carried on by the Bureau of Mines that have for their object the testing of methods by which the mineral fuels in this country may be used more efficiently. A better understanding of the laws governing heat transmission into boilers will result in the design of more efficient generators, and more efficient boilers will reduce waste in the use of fuel. The "Bulletin" contains the following:

"Nearly 100 years of practical investigation of boiler and furnace problems has resulted in little advance. Perhaps the main reason why many of the investigations failed to bring about progress was that boiler and furnace, being considered a unit, were investigated

together. Various combinations of boilers and furnaces have been built and tested without thoughtful planning, and many of the published results of such tests confuse the performance of the boiler and the furnace in such a way that it is difficult, if not impossible, to tell which of the two should be blamed or praised for the poor or good results obtained from the combined apparatus. Evidently, many persons have thought that the combined efficiency could be greatly increased by some mysterious manipulation.

"The principles governing the combustion of fuel in boiler furnaces and the absorption of heat by boilers have been little understood. The dogmas that the area of grate should have a certain ratio to the area of the heating surface, and that it takes 10 square feet of heating surface to make 1 boiler horse power, seemingly had become so thoroughly fixed in the mind that they were hardly ever questioned. It is only within the last decade that a few engineers have broken away from the old rule of-thumb methods and have begun to investigate the functions of the boiler and furnace separately. Their studies seem to mark the beginning of advance in steam generating apparatus.

"The boiler is the metallic vessel that contains water and steam and absorbs heat; consequently it should be situdied as a heat absorber.

"The furnace is that part of the steam generating apparatus in which the potential energy of the coal is changed into heat; consequently it should be studied as a heat generator."

Management & Commercial Methods.

PROGRESS IN THE STOVE TUBING FIELD.—The Chicago Tubing & Braiding Company, 117-121 North Jefferson street, Chicago, long an important factor amongst the reliable and progressive manufacturers of gas tubing, announces an important addition to its lines, in the nature of a tube called "Everlasting" (patent applied for). Its function is to act as a steel-center tubing for stoves, hot plates, etc., the steel being in one continuous strip. Another notable feature is the substitution of a special composition for the usual rubber or asbestos packing, which often dries out. Over the composition (see illustration) is braided a covering of lustrous silkoline. The named Chicago concern is the sole maker of this tube and makes strong claims for it. The list price of "Everlasting" looks moderate. An aggressive selling campaign is being carried on, and generous samples are sent on request

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,035,208. Automatic Cut Off Valve for Gas Burners. F J. Madden, Albert Lea, Minn., assignor of one-half to O. K. Earle, Minneapolis, Minn.

1,035,287. Discharging and Charging Machine for Gas Retorts. J. West, Southport, England.

1,035,455. Burner Attachment. E. M. Lloyd, San Jose, Cal , assignor of one-half to T. H. Ball, same place.

1,035,467. Safety Valve for Gas Lines. E. A. Radunz and O. Engelhardt, Toledo, O.

1,035,477. Apparatus for Lighting and Extinguishing Gas Lamps. T. M. Sandiford, Masterton, New Zealand, assignor to the Automatic Gas Pressure Lighter Company, Limited, same place.

1,035,517. Gas Burner. F. M. Ashley, New York City.

1.035,581. Apparatus for Producing Endothermic Reactions in Gases. P. A. & C. E. Guye, Geneva, Switzerland.

1,035,723. Method and Apparatus for Producing Chemical Reactions in a Mass of Gases. A. A. Naville and P. A. & C. E. Guye, Geneva, Switzerland, assignors to Southern Power Co., New York City.

Items of Interest
FROM VARIOUS LOCALITIES.

MR. JOHN F. WESSEL has been appointed General Manager of the Mahoning and Shenango Railway and Light Company, with headquarters in Youngstown, O. He is a graduate of the Massachusetts "Tech.," and was not long ago Electrical Engineer to and for the Lynchburg (Va.) Traction and Light Company.

MR. L. F. EVANS (New York) is informed that at the meeting of the Public Utility Company, of Evansville, Ind., the officers elected were: President, H. W. Marshall, Lafayette, Ind.; First Vice-President, B. C. Cobb, New York; Second Vice-President, Wm. H. Barthold, New York; Secretary and General Manager, A. A Blinn, Evansville, Ind.; Treasurer, F. J. Haas.

THE Montpelier (Ind.) Light and Water Company's plants were sold at auction some days ago by order of the Citizens Trust Company, of Fort Wayne, Ind., acting under petition of the first mortgage bondholders. Judge Walter Olds, of Fort Wayne, representing the Trust Company, bid in the plant for the sum of $55,000. The plant will now be reconstructed, and the bondholders' committee will remain actively in charge, for a twelvemonth at least. It is quite certain that Mr. John Boyd, who has been Receiver for the Company since 1909, will be continued as General Manager.

THE Beloit (Wis.) Water, Gas and Electric Company will occupy its new business quarters in the Ackley Building, on or before October 1, 1912.

THE net earnings available for dividends of the subsidiary Companies in the Massachusetts Gas Companies for July, 1912, as against those for the corresponding month in 1911, were $163,673, an increase for the current year amounting to 22.26 per cent. An itemized statement of the earnings of the subsidiaries for the time named, is appended:

Company.	1912.	1911.	1910.
Boston Gas.	$63,593	$61,154	$62,123
New England Gas	60,655	46,824	41,007
East Boston Gas	5,719	3,263	3,185
Quincy Gas	1,857	2,788	2,079
Newton Gas	3,885	3,591	3,329
New England Coal ...	22,962	11,760	17,527
Federal Coal	*2,235	381	1,157
Boston Tow Boat	5,767	2,906	. ...
Total...	$162,206	$166,671	$130,410

* Deficit.

MR. THOMAS NICKERSON has been succeeded as Manager of the Haverhill (Mass.) Gas Company by Mr. Frank M. Roberts, Manager, Commercial Section, Fall River (Mass.) Gas Light Company.

A TURBINE for the Norwich (Conn.) Gas and Electric Company has been set up in its plant on North Main street. The apparatus is of the type manufactured by the General Electric Company, Schenectady, N. Y.

AT a joint meeting of the Directors of the Columbia Gas and Electric Company, and of the Union Gas and Electric Company, Cincinnati, Mr. A. B. Leach, of New York, was elected President of both corporations; Mr. Jas. C. Ernst (Covington, Ky.), and Mr. F. B. Enslow (Huntington, West, Va.), were retained as Vice Presidents; and Mr. Wm. Hunter was elected Treasurer and Secretary. Mr. Jas. C. Ernst was chosen First Vice-President of the Union Company.

MR. S. E. DE FRESE, since 1895 in the service of the Chattanooga (Tenn.) Gas Company, and for quite a while its efficient, capable manager, is rejoicing at last in the possession of business headquarters suitable for the Company's importance as one of the leading factors in the business of this fast-growing Tennessee city. The quarters are in a handsome building, 809-811 Broad street. Possibly we can prevail forthwith on "Major" De Frese to give us an illustrated description of his business headquarters, an invitation to furnish which is herewith extended to him. And the further wish is expressed that in the next 17 years the growth of his Company will at least equal that recorded for his first 17.

SUPERINTENDENT A. A. LAUGHTON, of the Gardner (Mass.) Gas Company, reports business good, which gratifying fact the "Super." asserts is largely traceable to the quality of the gas supplied.

ADVICES from Austin, Tex., dated the 17th inst., are to the effect that the Wichita Falls Electric Company has been incorporated, with a capital of $700,000, to sell gas and electric currents for lighting, cooking and power purposes in the Wichita Falls district. The Directors (as well as the incorporators) are: D. G. Fisher, W. H. Painter, F. B. Cruger, Frank Smith and C. Hunn, of Dallas.

ADVICES from Taylorville, Ills., by way of Decatur, Ills., dated August 15th, declare it is likely that the Taylorville Gas and Electric Company and the Pana Gas and Electric Company have already passed into other hands, in that mail advices recently received by the Circuit Clerk-Recorder, of Taylorville, request copies of the articles of incorporation of the named corporations, the request being made by Messrs. Isham, Lincoln & Beale, a well-known law firm of Chicago. It has been known for some time that an option had been taken on the property here of the Taylorville Gas and Electric Company, but the holders of the option were not known. Now it looks as if the attorneys for the corporation or individuals were getting to act decisively on the option. The Commonwealth Edison Company, of Chicago, the Public Service Company, located at Mattoon, and F. S. Peabody, the Illinois Midland capitalist, have all been buying electric lighting plants in the State lately, and whether they are acting separately or are in gigantic combine cannot be learned, but it is reasonable to believe that one of these three wishes to secure the Pana and Taylorville plants. It is very likely that it is the Public Service Corporation, which has increased its capital stock from $30,000 to $6,000,000, and purchased plants at Charleston, Mattoon, Arcola, Tuscola and Paris, the ultimate purpose being to build an interurban railway in connection with the lighting plants. The Taylorville and Pana plants are owned by the National Light, Heat and Power Company, of New York, and it looks that these properties are now pretty heavily bonded.

THE proprietors of the Worcester (Mass.) Gas Light Company have purchased a 4-acre tract on Quinsigamond avenue adjoining its present property, which tract was owned by the Crompton & Knowles loom works. The tract contains 194,313 square feet, and completes the Company's holdings on the west side of Quinsigamond avenue, from Lafayette street to the property of the Reed-Prentice Company.

BY a vote of 4 to 2 the City Council, of Omaha, decided to accept the report of the special committee, which agreed to compromise the old claims (those have been hanging fire since 1907) of the Omaha Gas Company at $24 per lamp per year and 2 per cent. interest.

"B. F. G." forwards the following from San Francisco, Cal., under date of August 9th: "The Pacific Gas and Electric Company has approved plans for a building of Class A type, to be erected at the southeast corner of K and 11th streets, Sacramento, for the exclusive use of the Company in the Capital City. The building will have street frontages of 50 and 80 feet, and 4 stories in height above the basement. It will be of full steel frame type, with terra cotta and pressed brick front. The plans were from the offices of E. C. Hennings, a well-known Sacramento architect. The ground floor will be devoted to the general public offices of the Company, affording quarters for the cashiers, bookkeepers, counter men and solicitors. Those offices will present the appearance of a modern bank interior, with ceilings, paneled walls, marble floors, wainscots and counters. There will further be a street railroad department on this floor, where car tickets will be on sale, and lost and found articles traced for restoring to their owners. There will be a ladies' waiting and rest room, with telephones and directories. In fact, the convenience of the public will be studied to the utmost, and the general scheme is to provide all the facilities of a department store. The second floor will be devoted to an appliance section on a huge scale, and here will be shown, properly displayed, every gas and electric appliance at present on the market. On the third and fourth floors will be located the business offices of the corporation."

"V. M. M." is informed that dividend checks on the preferred stock of the Wilmington (Del.) Gas Company (semi-annual, 3 per cent.) will be mailed the 1st prox.

ADVICES from San Francisco, Cal., dated the 12th inst., says that Mr. Elmer Dover, President of the Tacoma (Wash.) Gas Company, has been appointed Pacific Coast Manager of the Byllesby Company's properties in that division of the United States. Mr. Dover will have supervision over the Western States Gas and Electric Company, which operates gas and electric properties in Stockton, Eureka and Richmond, Cal.; the Oregon Power Company operating similar plants in Oregon cities; the Northern Idaho and Montana Power Company, the Everett Gas Company and the Olympia Gas Company. Pacific Coast headquarters will be located in Tacoma, where the engineers, accountants, auditors, etc., will be centralized. Headquarters were formerly in Portland. Mr. Dover has had much experiences in the management of large corporations, having been the right-hand man of the late Senator Mark Hanna, in the managing of his mining lake transportation and other industrial properties. Still later he was Secretary of the National Republican Committee.

THE Peoples Gas and Electric Company, of Oswego, N. Y., has filed a claim in the sum of $176,691, against the State on account of damages to its power station through the barge canal improvements or changes now being made in and about Oswego.

THE New Jersey Consolidated Gas Company has filed a certificate announcing an increase in its capital stock to $10,000,000, from $1,000,000. The Company, as our readers likely know, is a consolidation of the Long Branch (N. J.) Gas and Electric Light Companies. It supplies gas to Long Branch, Red Bank, Asbury Park and other lesser points along the South Jersey coast, also electric light and power to several other New Jersey settlements, including Elberon, Branchport and Monmouth Beach.

THE regular quarterly dividend (1½ per cent.) of the Brooklyn Union Gas Company is payable the 1st October.

MR. C. M. EYMAN is to be retained as Manager of the Boise City (Idaho) plant, which was recently taken over from the Kelsey Brewer Company by the American Public Utilities Company—in reality the latter is the successor to the former. Under the Kelsey-Brewer control, which was assumed last November, the Boise plant has been virtually rebuilt.

MR. G. H. SMEDLEY, for several years Manager of the Salina (Kas.) Power and Gas Company, will come East the 1st prox., to enjoy a lengthy vacation.

RECENT advices from Richmond, Va., are to this effect: "Superintendent Knowles, of the municipal gas plant, has good reason to be satisfied over the showing made by it for the first half of 1912. The City Auditor, early this year in making up his estimate of receipts by the city for the year, estimated that the increase in gas receipts would equal $10,782.60, but the actual increase for the first half exceeds that sum by $22,800. The large increase, according to Inspector Joseph M. Shelton, is due largely to the greater use of gas as a domestic fuel, aided by the sensible additions to the main system made during 1911. Under the ordinance recently adopted by the City Council, the Gas Department has been empowered to pipe houses heretofore unpiped, without charging the house owner for same, and this is bound to result in a still further large increase in the output."

MR. THOMAS AIRY has resigned the post of Superintendent to the Flemington (N. J.) Gas Company.

THE contract for the gas plant to be constructed in Valley City N. Dak., has been awarded to the Western Gas Construction Company, of Fort Wayne, Ind. The agreement between the contracting parties calls for the completion of the plant by November 1st, next.

THE St. Louis County Gas Company's efficient management, with President and General Manager Mr. A. C. Einstein at its head, is comfortably housed in offices, located at the junction of Lockwood and McClure avenues, Webster Groves, St. Louis county, and, despite the fact that the Company's main system was this year extended by the placing of many miles of pipe, the plannings on like account for 1913 are on a much greater scale.

THE Associated Gas Company, through its solicitor (Mr. Lyman D. Gilbert), has notified the Governor of Pennsylvania that his principals will make application for a charter under which they propose to manufacture and supply gas, for lighting purposes only, in the boroughs of Greencastle, Mercersburg and Orrstown and the townships of Antrim, Fannett, Green, Guilford, Hamilton, Letterkenny, Lurgan, Metal, Montgomery, Peters, Quincy, Southampton, St. Thomas, Warren and Washington, in the county of Franklin

The Market for Gas Securities.

The market for gas shares was vacillating and more than uncertain during the week, which unsettled condition is likely chargeable to the state of the general market. Money is a bit up, however; 'tis time it was. Nevertheless, the money market is being closely watched just now, for several big undertakings are near to the incubation stage. Consolidated is 145⅓ to 145¼, or virtually a point off from Friday last.

Brooklyn Uuion is also on the descending scale, but it will not be long in that listing. Its financial position is too staunch for such result. Peoples, of Chicago, is fairly steady, which remarking also applies to Lacledes. The regular quarterly dividend (1¾ per cent.) of the American Gas Company is payable next Saturday.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

AUGUST 26.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	Capital.	Par.	Bid.	Asked
Consolidated Gas Co.	$78,177,000	100	145⅛	145¼
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	8,000,000	1,000	103	105
Equitable Gas Light Co.—				
Con. 5's, due 1962, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	8,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	85	50
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	109
Standard	5,000,000	100	60	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	147	149
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	999,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	7-16	⅜
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	85
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,860,000	1,000	104	106½
Cincinnati Gas and Electric Co.	29,500,000	100	87	90
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,064	—		—
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	10,661,000	—		—
Con. Gas Co., Baltimore City, 4½	2,751,000	—		—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Detroit City Gas Co.	6,580,000	—	—	50
Detroit Gas Co., 5's	381,000	1,000	75	80
" Prior Lien 5's	5,619,000	1,000	97	100½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	130	138
" Bonds, 5's	10,500,000	—	101	106
Indianapolis	2,000,000	—	—	38
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	99	102
Laclede Gas Co., St. Louis.	10,000,000	100	107¼	107½
Preferred	2,500,000	100	90	100
Bonds	10,000,000	1,000	102¾	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	120
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Massachusetts Gas Companies, of Boston	25,000,000	100	89¾	0
Preferred	25,000,000	100	95⅛	95¾
Montreal Gas Co., Canada	2,000,000	100	233	236
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	182	190
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	116½	117
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105¼
Pacific Gas and Electric Co.	15,500,000	—	64	65
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	98	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	106
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	420	425
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October 16 to 18, 1912. Marlborough-Blenheim Hotel, Atlantic City, N. J. Officers: President, Ira C. Copley, Aurora, Ills. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting and Gas Show, Toronto, Aug. 26th to Sept. 7, 1912. Officers President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 9, 1912. Officers: President, R. M. Searle, Rochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Gas Meeters.—Monthly meetings. Chairman, Will W. Barnes; Commissioners, W. H. Pettes, I. W. Petty; Secretary, H. Thurston Owens, 42 Pine street, New York City.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 19th and 20th, 1913. Chicago, Ills. Officers: President, H. O. Channon, Quincy, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting, Niagara Falls, Canada, Sept. 16-19, 1912. Meetings of Sections, monthly. Pres't, V. R. Lansingh, New York City; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March, 1913, Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Phimer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, Burlington, Ia., May 22, 23, 24, 1913; Officers: President, C. W. Fair, Atlantic, Ia.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October 17-19. Manhattan, Kas. Officers: President, B. F. Eyer, Manhattan, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association—Annual meeting, September 4-6, 1912; Toronto, Canada. Officers: President, F. W. Blowers, Kalamazoo, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Joplin, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and Gas Show, Dec. 2-5, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, Cleveland, O., May, 1913; Officers: President, M. B. Daly, Cleveland, O; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, ——— 1913 Boston. Officers: President, D. D. Barnum, Worcester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Fall Meeting, Sept. 21, Atlantic City, N. J.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn Belmar, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, May, 1913. President, Noel R. Gascho, Alva, Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Diego, Cal., September 17, 18, 19, 1912. Officers: President, W. Baurhyte Los Angeles, Cal.; Vice President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, John A. Britton, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, York, Pa., April, 1913; Officers, President, H. H. Ganser, Norristown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 18, 1912; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, ——— 1913, ——— Officers: President, C. E. White, Montgomery, Ala.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. April ——— 1913, Galveston, Tex. Officers: President, F. M. Lege, Jr., Galveston, Tex.; Secretary, H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May ——— 1913, Milwaukee, Wis. Officers: President, I. F. Wortendyke, Janesville, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.